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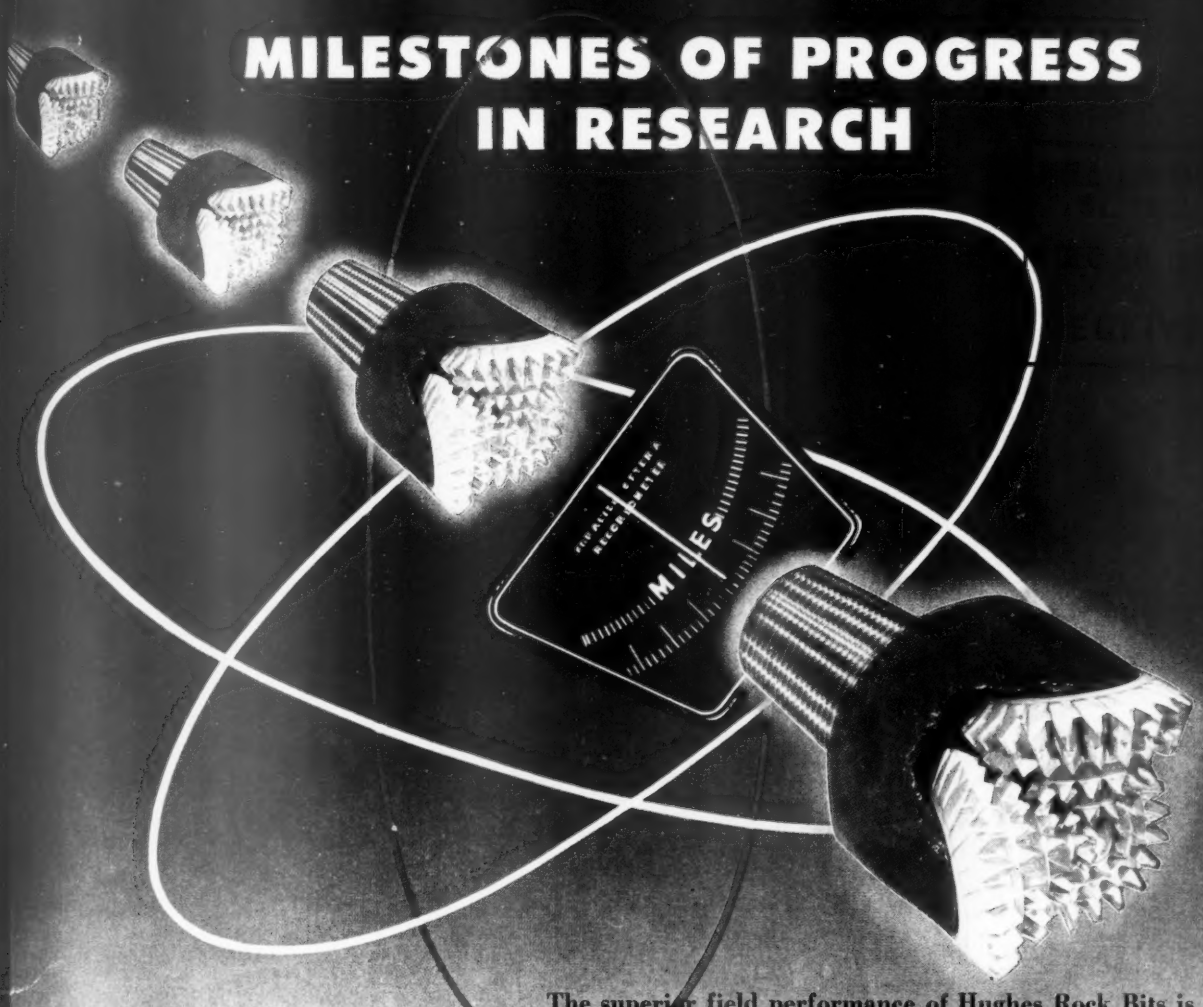

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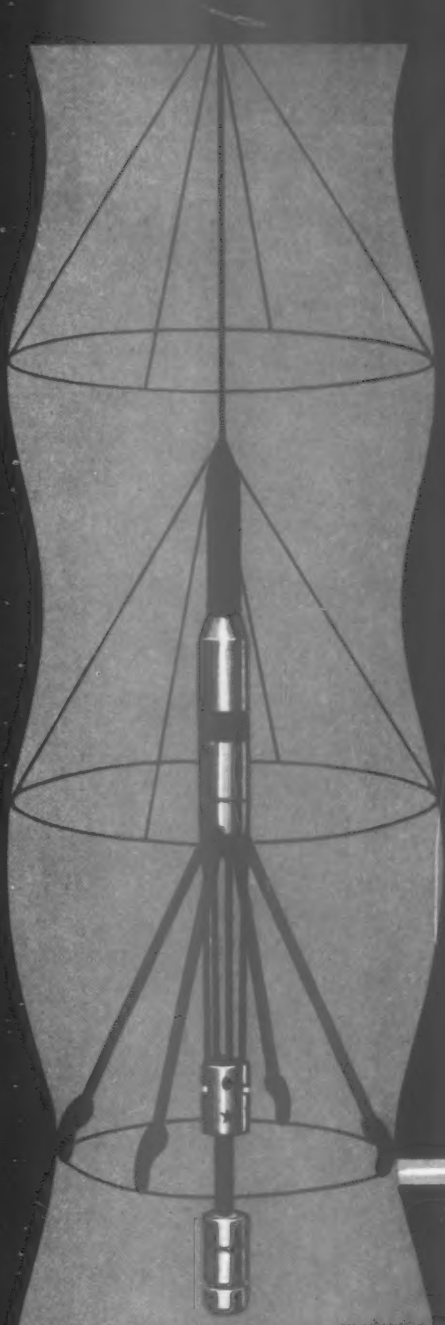

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Table of Contents

NEWS DEVELOPMENTS

Industry Can Thrive Only Under Free-Enterprise Stimulus . . 56
Lea Subcommittee Hearings Postponed 57
British Will Permit Purchases of Equipment in U. S. 60
British-Mexican Oil-Property Dispute Is Due for Airing 60
Only Production in Egypt Comes from Two Fields on Suez . . 62
International News 66
Ickes Urges Centralization of Oil Activities 69
Navy's Oil Plan Outlined Before Congressional Committee . . . 69
Draft Deferment for Research Workers, Students Proposed . . 70
Three-Man Panel Would Act in Wage Disputes 70
Engineers Discuss Dimethyl Silicone Fluids at A.S.M.E. Meet 73

Trends 55
This Week 59
Editorial 61
Deaths in the Industry . . . 75
Refining News 122
Natural-Gas News 125
Natural-Gasoline News . . 125
Pipe-Line News 126

ENGINEERING AND OPERATING

Oklahoma at Important Threshold with New Deep Pools 76
Regeneration of Caustic Solutions for Gasoline Treating 83
Practical Petroleum Engineering—Part 8 92
Optimum Rate of Production—Part 15 105
Oil and Gas Equipment Digest 117

Progress in Metals 101
Plant Practices 103
Refiner's Notebook 111
Eng. Fundamentals 113

EXPLORATION AND DRILLING

Week's Highlights 129
Weekly Well-Completion Record 129
Daily Average Production for Week 130
Reports by Areas Start on Page 130

ADDITIONAL FEATURES

Drilling Contractors 140
Events on the Calendar . . . 141
Personals 142
Classified Advertising . . . 145
Market Summary 148
Index of Advertisers 148

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Trends

Crude-Oil Production By States—Page 130

CRUDE-OIL STOCKS 219,363,000 bbl. as of Nov. 24—down 1,140,000 bbl. One year ago 221,591,000 bbl.

GASOLINE STOCKS 83,184,000 bbl. as of Nov. 24—up 2,230,000 bbl. One year ago 79,711,000 bbl.

RESIDUAL FUEL-OIL STOCKS 46,474,000 bbl. as of Nov. 24—up 866,000 bbl. One year ago 63,047,000 bbl.

GAS OIL AND DISTILLATE STOCKS 45,258,000 bbl. as of Nov. 24—down 83,000 bbl. One year ago 46,513,000 bbl.

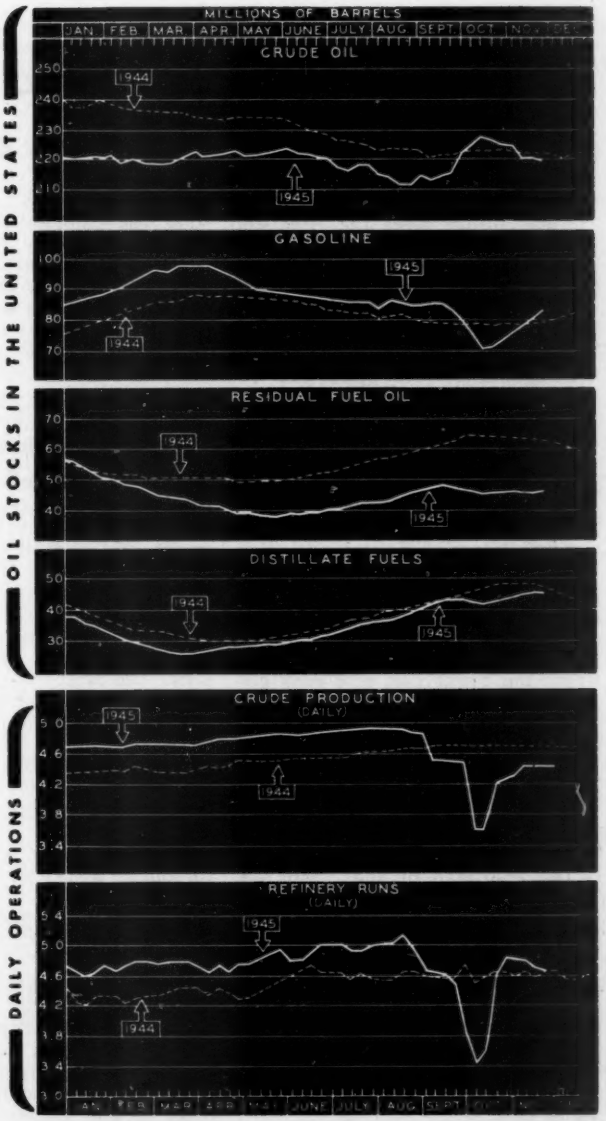
CRUDE-OIL PRODUCTION 4,439,600 bbl. as of Dec. 1—down 30,900 bbl. One year ago 4,710,300 bbl.

REFINERY RUNS 4,648,000 bbl. daily week ended Nov. 24—down 45,000 bbl. One year ago 4,706,000 bbl.

THE Bureau of Mines report this week giving the estimated demands for crude oil by states for December and the preliminary national figure for the first quarter of next year further emphasizes the operating adjustments that will have to be made in refinery and field operations over the next 90 days. As has been reported in these columns in recent weeks the actual domestic and export demands for petroleum products have exceeded the estimates of most economists and sales managers made at the time the Japanese war ended. This development is interpreted to reflect the basically strong postwar consumption position of petroleum in this country and foreign areas.

THE Bureau of Mines and other reports, however, point to the fact that some further downward adjustments in domestic operations will be necessary before the petroleum industry arrives at its postwar base, which from the standpoint of both domestic and world requirements will be substantially higher than during the prewar period. The B. of M. estimates that the domestic crude-oil demands this month will total 4,542,000 bbl. daily, a decrease of 58,000 bbl. compared with November and about 400,000 under the peak operations of late summer. It is of interest in connection with the further contractions that will be necessary to compare the projected operations for this month with the actual estimated production the week in August which brought the Japanese victory. Compared with the week ending August 18 and the Government's projection for this month the following daily reductions have become effective: Texas, 282,700 bbl.; California, 85,450 bbl.; Wyoming, 17,000 bbl.; Kansas, 7,700 bbl.; Mississippi, 7,050 bbl., and Oklahoma, 3,000 bbl.

THE Bureau of Mines has estimated that the demand for domestic crude oil the first quarter of 1946 will average 4,200,000 bbl. daily. The question that will be raised is whether the bulk of this additional decrease must come from Texas and California, which have had most of the reductions so far. These two states accounted for most of the war expansion in crude-oil output. Observers with recent market trends in mind, are of the opinion that while further downward revisions in output are in prospect for the two states, analyses should be made of future requirements in other smaller areas, which so far have maintained output within 5 per cent of their war peaks.



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Industry Can Thrive Only Under Stimulus Of Free Enterprise, Committee Is Told

by Henry D. Ralph

WASHINGTON.—A brilliant post-war future faces the American oil industry if the Government provides a climate in which it can remain competitive and dynamic, it was agreed by all top officials of Petroleum Administration for War testifying last week before the Senate committee on petroleum resources.

Domestic and world-wide demands will soon outrun productive capacity but, as Administrator Harold L. Ickes expressed it, we will not run out of oil unless we let ourselves run out. The oil industry has come out of the war in strong position, with little or no excess capacity, with its competitive situation unchanged, and free from all government controls except price.

An even dozen PAW officials spent the better part of 3 days giving the committee an account of their stewardship in providing oil for the war and laying the basis for a future national oil policy. Their presentation included more than 40 elaborate colored charts, 200 pages of printed data, and some 12 hours of oral discussion.

The chairman of the committee, Sen. Joseph C. O'Mahoney of Wyoming, had the highest praise for the way in which the oil war activities were planned and executed, and from the review he drew this lesson:

"The war oil operation was successful because it was planned. Now we must plan for the future. If we want a free economy we must plan for it to prevent a drift into something else."

Although much of the presentation was historical—excellent source material for any review of what happened to the oil industry during the war—the PAW men supplied plenty of reasons why the Government should plan for a free economy in oil and the ways in which this can be done.

The testimony ranged the entire gamut of the oil industry, domestic and foreign, past, present, and future, but some of its highlights were:

The greatest achievement of PAW, basic to all its other achievements, was the demonstration that government and industry can work together.

It is highly desirable that some means be found to continue harmony and broad cooperation between industry and Government after the war.

If the oil industry is kept free from the kind of government controls it operated under during the war it will remain sufficiently competitive, vigorous, and flexible to supply all demands and meet all contingencies.

Civilian demands for petroleum products will very soon equal or exceed wartime demands, though the types of products may be different, requiring changes in refining economics.

The best safeguard against any national emergency is a margin of productive capacity rather than crude reserves in the ground.

Without important new discoveries our crude productive capacity may decline sharply in the near future; likewise our refining capacity may soon be inadequate without new construction.

With an adequate price incentive, and freedom from government restrictions, private industry will discover more crude and build whatever new facilities are necessary.

Natural-gas reserves have increased tremendously during the war, and so has our knowledge of gas utilization, so natural gas may be a very important source of liquid hydrocarbons within a few years.

Foreign oil production and refining will expand more rapidly than in the United States, and the U. S. Government should assist and encourage American companies to play an active part in this expansion.

Foreign operations of American oil companies will be mainly to supply foreign markets, but a flexible import policy should be evolved, adjustable to changing conditions, so that the domestic price will be high enough to encourage investment and expansion but low enough to stimulate economies and consumption.

The war job was done only because the American oil industry was large and vigorous; so our hope for the future, in peace or war, depends on keeping it that way.

If the war had continued through 1946, as planned, we would have been desperately pressed to provide the oil needed for projected operations and the effect on our productive capacity would have been very serious.

Secretary Ickes, in summing up the testimony, told the committee:

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C. STRIBLING SNODGRASS | JAMES E. PEW | ROY F. HAWKINS | C. L. HARDING

"This is the kernel of our oil problem: We are confronted with enormous demands for liquid hydrocarbons. Our known reserves of today cannot supply those demands for any protracted period. So, it seems reasonably obvious to me that this situation calls for creative efforts along four lines:

"First—by the stimulation of exploration, so as to transform 'potential' or unknown reserves into known or proved reserves—in other words, getting new sources of productive capacity.

"Second—by efficient use — making what is 'known' last longer.

Third—by encouraging further advancement of technology in finding and developing petroleum resources and in the art of refining as well.

"Fourth—by assuring ourselves of access to foreign oil resources to supplement our domestic resources, as needed."

No Time for Complacency

The prospect of declining reserves, Ickes said, does not permit of complacency, and while the job of exploration and development should be done by private industry there must be a recognition of national interest in our oil reserves, meaning that the Government must make certain that it will have all the oil it requires in the future. There needs to be a continuing understanding between Government and industry on many fronts—an understanding which will recognize both private interest and public concern, he said, explaining that there are jobs that are properly solely those of the industry and concerns that are properly those of Government. He advocated that the Government participate with industry in exploratory work on public lands.

Emphasizing that "in war or peace the United States has only one oil barrel," Ickes ridiculed the idea of Naval petroleum reserves and asked that all oil matters be administered by a single federal agency. "What we need is a national policy, devoid of departmental acquisitiveness and having regard for the oil needs of the armed forces of the nation as a whole."

The opening statement of Deputy Administrator Ralph K. Davies, summarizing "Oil in Peace and War," was praised by Chairman O'Mahoney as the most succinct statement he had ever heard in 12 years in Congress. Throughout this statement Davies emphasized that the tremendous job of supplying oil for the war could not have been done without the closest cooperation of the oil industry and was possible only because the industry was in a vigorous condition and had excess productive capacity.

Postwar demand prospects are so great, Davies said, that our present margin of excess capacity is not comfortable, and measures should be taken to improve the situation. He especially advocated keeping the industry competitive, and free from government controls, and early removal of all price controls. He said that from the standpoint of supply and demand there is no longer any reason to retain price controls in the oil industry, and that prompt removal would permit the correction of current difficulties such as the shortage of kerosene.

Davies advocated state regulation of conservation practices, but warned that national interest in this problem is so great that important oil-producing states are not unlimited in their freedom to refrain from any action. He also asked that the anti-trust laws be amended to permit voluntary agreements among oil producers to enter voluntary cooperative plans for conservation practices.

After introducing 10 PAW division directors to explain their phases of the activities in detail, Davies again took the stand to summarize the testimony and point to the future. He discussed such broad trends as the increasing importance of liquid hydrocarbons as sources of the world's energy, shifts in product demands altering the economies of the industry, the probabilities that residual-fuel-oil production will decline sharply, and the use of natural gas for higher purposes than boiler fuel. These last two trends, he said, suggest that the oil industry has nothing to fear from the industrial application of atomic energy if, as now seems probable, atomic fission will find its first applications in central power plants rather than mobile engines.

Davies' chief conclusion was that the American oil industry can make all future adjustments in its stride if it is kept vigorous and free to adapt itself. He had no fear of monopoly in view of the changing prospects for the future because of the fact that many small companies have

Lea Subcommittee Hearings Postponed

WASHINGTON. — The Lea Petroleum Subcommittee of the House has postponed until early January hearings originally scheduled for this week to hear officials of Petroleum Administration for War review their war activities and make suggestions for future government policies regarding oil.

Although PAW will be virtually liquidated by that time it is planned to call back former division directors to make the presentation. The information probably will be much the same as that presented to the O'Mahoney committee of the Senate last week, with additional historical details.

The Lea committee for several years has held periodic hearings to review the current petroleum situation, and the forthcoming hearing is considered a routine step in this program rather than an investigation.

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grown large in the past decade or two by reason of their ability to take quick advantage of new situations.

How to stimulate the growth of the oil industry is therefore the chief concern of the Government, Davies concluded, outlining the means as follows:

The United States should have a consistent, long-range national oil policy, deeply rooted in public opinion.

The Government should support the growth of American oil activities in foreign fields by insisting on equality of opportunity, international fairness, and no confiscation or discrimination.

A continuing flow of investment capital into small companies to maintain fluidity in the industry and attract new recruits. The industry needs the benefits of thousands of independent judgments, and a multitude of small companies is the best assurance against monopoly or government control. Small companies have a bigger risk than large ones and need a chance for more than a modest return on this risk, but they will get the capital if the price of oil makes the return attractive.

Continuous protection from imports but varying in degrees from time to time as conditions change and continuously studied and adjusted to keep the domestic price of crude high enough to encourage exploration and maintain a safe margin of excess productive capacity but not too high to remove incentives for lower costs, drive refining of foreign crude overseas, or make consumer prices excessive.

Removal of price control, since the oil industry has not yet been freed from government controls and is unable to function as in a free competitive economy.

Continued cooperation between Government and industry. The many federal agencies having something to do with oil or gas cannot be consolidated but their programs could be coordinated and there should be a mechanism for exchanging information and views between them and the industry if there is to be a coherent national oil policy and improved administrative efficiency. The upper-bracket personnel of government oil agencies should be improved by higher salaries. Both House and Senate should have permanent, continuing committees dealing with all oil problems. The oil industry should establish a body to provide a continuous two-way contact with the Government and provide the federal agencies with advice and counsel, but should not undertake to perform any functions of Government.

In case of another national emergency a single federal agency should be created with power to deal with all phases of the oil problem and should be staffed from and work closely with the oil industry.

The papers and charts presented by the various PAW directors briefly described the more important problems faced by PAW, the ways in which they were met, and the effect of this on the postwar industry. Though dealing mostly with the past, they contain much information which it was impossible to publish during the war. Briefly mentioned, these presentations were:

"Mobilizing the Oil Forces," by H. Chandler Ide, executive assistant to the deputy administrator. Ide sketched the organizational structure of PAW and its industry committees, and the way in which close cooperation was achieved without delegating government functions to the industry.

1946 Demand Predicted

"Wartime Petroleum Requirements and Programing to Meet Them," by Howard W. Page, director of the program division. Page predicted that the 1946 demand for petroleum products would be about the same as 1944 actual consumption, or 1,000,000 bbl. per day greater than 1943 consumption, but satisfying these demands involved an entirely different refining problem now that demand for aviation gasoline is less than it was in 1942. British military requirements for 1946 are quite high, and U.S. military requirements will remain far above 1938 levels, while Europe is asking for very large quantities of kerosene and fuel oil because of the coal shortage. The fuel-oil situation will be tight throughout 1946 and the maximum production from foreign sources will be required to balance it. Crude production worldwide will be about 6,000,000 bbl. per day, and in the United States only slightly below maximum efficient rate of production. In response to a question, Page gave this breakdown of motor-gasoline demand: 1941, 1,771,000 bbl. per day civilian and indirect military, 85,000 direct military and export; 1943, 1,240,000 civilian, 182,000 military and export; 1946, 1,641,000 civilian, 183,000 military and export.

"Wartime Petroleum Production in the United States," by Philip H. Bohart, director of production. Bohart pointed out that World War 1 did not change the crude-production curve while World War 2 required production in excess of maximum efficient rate, but the postwar situation in both instances is the same with consumption feared to be in excess of productive capacity. The deficiency in discoveries of the past few years is not due primarily to the war, for the trend has been downward, and now a price incentive must be given to stimulate exploration and development. One of the most important lessons of the war regarding oil is that we must have a margin of excess productive capacity, and it is urgently necessary to encourage drilling which is the only way to increase reserves.

"Wartime Distribution and Marketing of Petroleum Products," by Walter Hochuli, director of distribution and marketing, presented by Charles Harding, director in charge of District 1. While about 25 per cent of the filling stations were closed during the war, Harding had no fears for independent marketers, saying that new stations would be opened up fast and the independent would be the backbone of the distribution business. After describing the controls over marketing, Harding said that the lesson for the future is to return the distribution of petroleum products to free and open competition.

"World Production of Crude Petroleum in Wartime," by William B. Heroy, director of foreign production. While U.S. crude production was the dominating factor in war operations, Heroy said the Allied needs could not have been met without heavy dependence on foreign oil. Had the war continued the United Nations would have used all world crude production available to pipe lines and tankers in 1945, and in 1946 there would have been extensive construction projects to utilize all potential productive capacity. The lesson from this, Heroy said, is that capacity to produce, rather than reserves locked in the ground, is the important factor in a national crisis, and he advocated maintaining our capacity to produce both in domestic and foreign fields.

"Petroleum Refining in the United States During the War," by A. P. Frame, director of refining. The trend in refining since 1900 has been marked by an increase in the volume of throughput, changes in the product yields, and increase in the quality of products, Frame pointed out, saying that this has greatly benefited the consumer and made it possible for the refining industry to do its war job. If the future demands different kinds of products, a free and flexible refining industry will be able to supply them. During the war the refining industry did many things which it would have considered impossible, and government action to preserve the industry in virile condition will benefit the nation for the future.

"World-Wide Refining in Wartime," by C. Stribling Snodgrass, director of foreign refining. During the war there was a large increase in the output of foreign refineries with little new construction, and the achievements of their operating personnel were notable. Snodgrass predicted a high rate of refinery con-

(Continued on page 75)

THIS WEEK

ECONOMIC—"Dynamic exploration" for oil reserves urged by Davies before O'Mahoney committee. . . . "Adequate price for crude most effective stimulus." . . . Favors conservation measures by states. . . . If these fail, then let federal Government take over. . . . Operators voluntarily entering programs for conserving oil and gas should not be under threat of antitrust suits. . . . Big and little inch lines should be disposed of on principle they "owe the United States nothing." . . . ¶OPA prices for crude during war cost Texas $1,500,000,000, President Byrd, of Independent Petroleum Association of Texas, writes to congressmen. . . . Texas increased its production 31.3 per cent, compared with 12.7 per cent in other states. . . .

STRIDES—Socony-Vacuum aviation department acquires fleet of planes. . . . "As incongruous for aviation salesmen to travel in anything except a plane as for automobile salesmen to use horse and buggy." . . . ¶Theoretical physics group organized by Standard Oil Development Co. will study possible industrial uses of atomic energy. . . . ¶German chemists develop process for making power fuel from hydrogen peroxide solutions for use in submarines and rockets. . . .

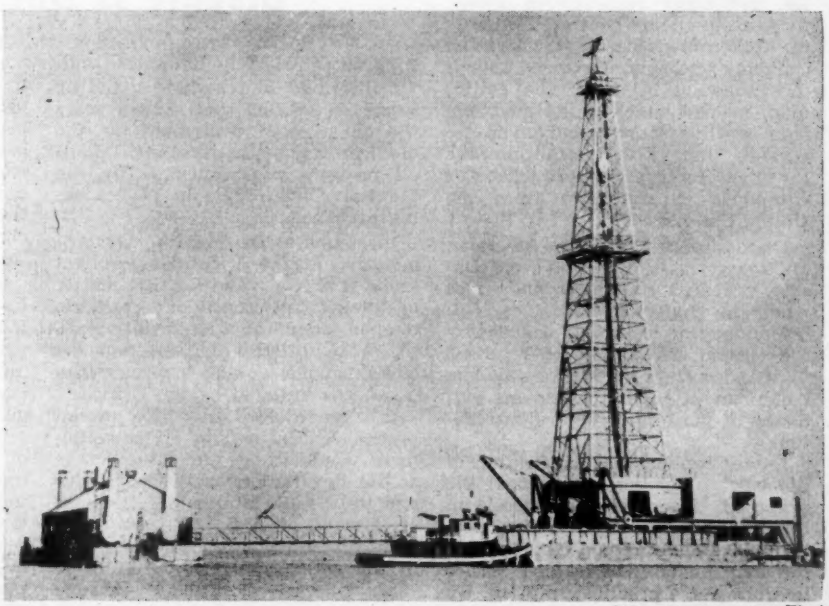
PRODUCTION—Nation's daily crude output, following rise for 6 consecutive weeks registers drop of 30,900 bbl. . . . Total daily average for week, 4,439,600 bbl. . . . No increases recorded. . . . Principal declines: California, 4,700 bbl.; Kansas, 18,750; eastern area, 5,250; Michigan, 2,500. . . . ¶Completions for week 542, up 11. . . .

DISAPPROVAL—Government's efforts to gain title to submerged oil lands is species of claim-jumping, Grover Sellers, of Texas, tells conference of attorneys general. . . . Urges passage of measure now before Congress designed to clear titles and preserve state rights. . . . ¶Holman scoffs at gloomy prophecies of oil famine. . . . "Nonsense." . . . Emerged from war with "greater reserves than we had to begin with." . . . New techniques, deeper drilling, new discoveries among factors that assure ample supply as long as needed. . . .

LABOR—Schwellenbach's appointment of three-man fact-finding panel to study dispute which caused Navy to take control of 53 refineries received with little enthusiasm. . . . No power to enforce findings. . . . Can merely make recommendations to Schwellenbach for transmission to Truman. . . . ¶Senator Moore, himself an oil man, declares refinery seizures illegal and grave error on president's part. . . . Right to strike "does not carry with it the right to ignore contractual obligations." . . . ¶Labor conference ends without any decision regarding wages, machinery for solving industrial disputes, or other definite constructive achievement. . . . Rejects proposal of settlements through fact-finding commissions. . . . Its suggestion that voluntary arbitration should be employed to adjust controversies over contracts is already embodied in most union-employer agreements. . . .

TRANSPORTATION—Plans for broad transportation survey seems unlikely to eventuate in action at present session of Congress. . . . House rules committee reported to balk at resolution to provide funds. . . . ¶Only 600,000 tons of natural rubber in sight to meet world's need of 1,500,000 in 1946, according to study group representing United States, Britain, France, Netherlands. . . . Difference will have to be made up by synthetic product. . . . ¶Passenger-tire quotas for December 2,500,000, same as in each of past 6 months. . . . ¶PAW revokes directive controlling importation and distribution of oil products in East Coast states. . . .

FOREIGN—Bill in Colombian congress would finance $8,000,000 program for reconstruction of country's jails and penitentiaries from taxes on oil companies. . . . ¶Creole sets new record with approximately 54 per cent of Venezuela's oil production. . . . Company's contribution to nation's total daily output of 1,020,000 bbl. is 555,544. . . .



This is the type of drilling operation which may eventually spread far into the Gulf of Mexico and at other portions of the United States shoreline as soon as the current controversy is resolved over state or federal ownership of the continental shelf

International News Photo

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British Will Permit Purchases Of Equipment in United States

WASHINGTON.—The British Government has given definite assurances that it will permit American oil companies operating in the British Empire to purchase oil equipment in the United States, according to testimony presented to the Senate committee on petroleum resources last week.

A. E. Ernst of the Foreign Economic Administration asked permission to make a statement while Ralph K. Davies, deputy petroleum administrator, was being interrogated on this subject by Sen. E. H. Moore of Oklahoma. Moore said that the pending Anglo-American oil treaty should not be ratified until the British agree to permit such shipments since, he asserted, British manufacturers are unable to make deliveries and there is no question of protecting sterling exchange since the American companies already have dollars to make the purchases in this country.

Ernst told the committee that when this situation was called to the attention of the British Government it was given prompt consideration and the British have not given very specific assurances that there will be no more difficulties. He explained that the original lists of equipment which it was proposed to purchase in the United States were drawn up mainly before the operators had had an opportunity to make first-hand examinations of refineries and other installations recaptured from enemy control. The British Government has now asked the companies to submit revised schedules showing in detail the equipment needed which is not available from sterling sources and given assurance that it will issue permits for the importation of whatever equipment is necessary from the United States.

Discussion of the Anglo-American oil treaty was a diversion from Davies' prepared statement, and arose when the chairman, Sen. Joseph C. O'Mahoney of Wyoming, asked why the British should not be required to abandon their restrictions against American oil operators as an evidence of good faith before ratification.

Davies replied that ratification of the treaty, and the operation of the proposed International Petroleum Commission, will provide a new basis for obtaining concessions from the British and will make it easier to work out a practical solution. He declared that he has great confidence that the British will drop their restrictions on American oil operators in British-controlled areas, and if they do not he will recommend that the treaty be canceled forthwith. He added that he would not be recommending ratification of the treaty if he thought there was any reason to believe that it would not be a success and that the British would not carry out their obligations under it, explaining that the language of the treaty, taken in conjunction with the minutes of the negotiations, is broad enough to require Great Britain to provide equal opportunity to American oil companies.

PRC Future Questioned

Senator Moore then brought up the matter of Petroleum Reserves Corp. which has recently been taken over by Reconstruction Finance Corp. with its name changed to War Assets Corp. Moore pointed out that while it would appear that the corporation is now dealing exclusively in surplus property its charter still permits it to engage in the oil business, and since it may become the owner of the big-inch and other pipelines, as well as considerable other oil-country equipment such as tankers and refineries, it still remains a threat to government competition to the private oil industry. Moore said he sees no reason for not abolishing the corporation entirely now and creating a new corporation with specific powers to dispose of surplus property if that seems desirable.

Davies replied that he thoroughly agreed with the view, but O'Mahoney stated that his interpretation is that PRC is now completely dead and its original purpose abandoned.

O'Mahoney then asked Davies whether American oil companies operating abroad should compete with foreign cartels or should join foreign government - industry partnerships. Davies' answer was that when the Anglo-American oil treaty becomes multilateral it will provide a means for dealing with the foreign cartel problem but in the meantime American companies must conform to foreign laws and customs if they wish to do business abroad.

The chairman asked how Davies reconciled his program of free enterprise at home and government partnership abroad, to which the deputy administrator replied that we must differentiate in view of present world conditions, and while not sacrificing our free enterprise ideals in the area which we control we must make American private enterprise free to compete abroad by permitting it to submit to regulation by foreign countries.

British-Mexican Oil-Property Dispute Is Due for Airing

MEXICO CITY. — Reliable, well-informed sources here make no secret of the fact that after 8 years the question of settlement for the Mexican Eagle (British-Dutch Shell) oil properties expropriated by the Mexican Government in 1938 is being broached.

Inasmuch as the Mexican Government has let the British Government know it is ready and for that matter has been ready since expropriation to open indemnification negotiations, the presumption is that the reported current move looking toward settlement was initiated by the British.

It is understood that any official procedure designed to effect settlement would follow the same course as did negotiations between Mexico and the United States in settlement of claims of U.S. oil companies whose property was also taken over in the general oil expropriation in 1938. That is, an official exchange of notes between the two governments would pave the way for the naming of a joint commission to appraise the value of the expropriated property. On acceptance of this appraisal indemnification payments would be agreed on. As yet the preparatory opening notes between the two governments have not been exchanged but the feeling here is that this development is in the making.

The Cooke-Zevada award in 1942 fixed the compensation for the five U.S. companies affected by expropriation at $23,995,991. Petroleos Mexicanos, the Mexican oil administration, has met periodic payments on this amount, with interest, since.

The British position in the wake of expropriation brought on a situation that resulted in the breaking off of diplomatic relations between the two governments. These relations were later resumed, however, and diplomatic envoys between the governments now hold the rank of ambassador.

FOUNDED IN 1910

BY PATRICK C. BOYLE

the OIL AND GAS JOURNAL

Petroleum's Ambassador

OIL MEN and others will gather in Washington next Tuesday to pay tribute to petroleum's outstanding ambassador, W. R. Boyd, Jr. Such recognition would have been entirely appropriate at any time in recent oil history because for more than a quarter century this oil man and diplomat has been everlastingly at his job of serving and representing a great industry.

In fact, for many years the oil business has been demonstrating its high regard for Bill Boyd by constantly electing or appointing him to offices with additional duties. These numerous votes of confidence culminated in his selection for the position of greatest industrial responsibility in a war in which victory came to those who were able to support their military on land and sea and in the air with an abundance of petroleum. It is in recognition of these latest achievements that the events of next week take place.

Boyd's career is not only typically American, but it is representative of petroleum's leadership. Born and reared in Texas, no native son of that state was ever more loyal and more steeped in those traditions which have to do with the highest standards of citizenship.

Boyd became a vital part of the American Petroleum Institute in its beginnings. For several years his duties centered in the formulation of policies from which has grown an organization able to carry on successfully the varied associational functions of a major industry. His duties broadened steadily, and annually since 1941 he has been elected president of the Institute.

It was when the war clouds gathered that the petroleum industry made full use of Boyd's long experience and qualities of leadership. The Petroleum Industry War Council was organized, and Boyd became its chairman—no other name was suggested.

PIWC achievements are so recent and they so covered the entire industry that they need not be recounted here. As to those qualities that would cause an entire industry to rally to his leadership, so that no task was left without ready hands to do it, Boyd's friends are in agreement. He represented every group within the industry. There were no favorites. The nation's welfare came first, and so far as the industry itself was concerned, all were on an equal footing in its Washington representation. An intimate knowledge of petroleum operations and unquestioned sincerity made friends for the industry in places of highest governmental responsibility. Boyd was both firm in his convictions and thorough in their application to the responsibilities at hand.

Then there are those qualities which are part and parcel of Bill Boyd—loyalty, good will, joviality, and humor which have extended his friendships across the nation and to many foreign lands.

This is not a swan song nor in any sense an obituary. It is an attempt to join those who are sending a few flowers to one very much alive and at the same time give recognition to all those who, as the industry's war representatives at the nation's capital, gave everything they had.

There will be more emergencies. Boyd, himself, at the twenty-fifth A.P.I. meeting last month said, "As we turn to peaceful pursuits let us remember that peace has not been won." There are more ambassadorial responsibilities in the offing.

XUM

MIDDLE EAST REPORT

No. 11

Only Production in Egypt Comes From Two Fields On Suez Gulf Shores

Pier for offshore drilling in Gulf of Suez in Ras Gharib area

by C. O. Willson

This is the second article describing oil activities in Egypt. This article is concerned with the activities of Anglo-Egyptian Oilfields, Ltd., which is the only company with crude-oil production and the only refining organization with the exception of a small plant owned by the Egyptian Government. An affiliated Shell company is also the largest distributor of products in Egypt.

CAIRO, Egypt.—The finding, production, transportation, and refining of crude oil in Egypt are largely a report on the activities of one company — Anglo-Egyptian Oilfields, Ltd., a Royal Dutch-Shell unit. Many companies have searched for petroleum in this country over a period of 60 years and an aggressive exploration campaign is assured for the postwar period but it so happens that the Anglo-Egyptian company is the only organization that has found oil supplies in important commercial quantities up to this time.

At present, the company is producing approximately 26,000 bbl. daily of crude oil from two fields discovered on the shores of the Gulf of Suez. The crude oil is transported in Shell-owned tankers from the fields to Suez at the south end of the Suez Canal, where the crude oil is processed at the company's refinery. The company also furnishes royalty crude oil with which the Egyptian Government refinery at Suez is operated. Anglo-Egyptian for years has been the principal supplier of petroleum products in Egypt.

Since 1940 the Anglo-Egyptian operation has been largely war directed. Fortunately the discovery of the Ras Gharib field—the only major pool so far developed in Egypt—in 1938 furnished the supplies for the expanding operation in a highly important war area. The war importance of the operation was early recognized by the Italians and Germans who dropped more than 100 bombs in the refinery area with no serious damage resulting. The Germans did succeed in sinking a loaded tanker in 1942 at Ras Gharib.

During the war, an associated company—Shell Co. of Egypt—on behalf of the British Army, built and operated a 75-mile pipe line from the Suez refinery to Cairo. Part of the equipment used in the line was secured from the United States under lend-lease. The line, which has a capacity of 7,000 bbl. daily, is 6-in. and was completed in January 1944. The pipe line in effect is an elongated loading rack of the Suez refinery connecting the plant to the principal petroleum center of Egypt. No decision has been made as to the postwar operation of the line.

Early Operations

The exploration operations of Anglo-Egyptian Oilfields, Ltd., date back to the early part of this century. It was not until 1908 that the company found its first production in the No. 1 well of the Gemsah field located on the western shore of the Gulf of Suez between the Ras Gharib and the Hurghada fields. Twenty-two wells were drilled in the field of which 10 were producers. The field was operated over a 16-year period starting in 1911 and is credited with an accumulative output of 1,300,000 bbl.

This discovery resulted in additional exploration in that general

area and in 1913 the Hurghada field was discovered on the west coast of the Gulf of Suez about 200 miles south of Suez. This field was of importance in World War I producing 1,700,000 bbl. of crude oil in 1918. Its peak output of 1,800,000 bbl. was in 1931. Its accumulative production over a 32-year period has exceeded 40,000,000 bbl. It is currently producing 1,400 bbl. daily of 22°-24° A.P.I. crude oil.

The production depths of the Hurghada field range from 1,700 to 2,200 ft. It is producing from Nubian sand formations lying unconformably below the Miocene. A total of 135 wells have been drilled in the field. As the field production has decreased, wells have been plugged and only 64 wells are now producing. All wells are pumping with present liquid output averaging 93 per cent water. The production is shipped by tanker to the refinery at Suez.

Ras Gharib

Except for this small output from the Hurghada field all of the Egyptian crude oil is coming from the Ras Gharib field. The field has produced about 45,000,000 bbl. of crude oil and its remaining producing reserve is estimated as about 55,000,000 bbl.

Because of the war there has been a rapid development of the field which was discovered in 1938. The output was expanded to 20,000 bbl. daily by 1940 and for some time has been maintained at an average daily output of 24,000 bbl. Under normal conditions the field's output would not have been maintained at as high a level.

The Ras Gharib field is located on a barren desert area along the west coast of the Gulf of Suez. The area provides no living accommodations and a necessary part of the field operations consists in providing complete facilities for more than 1,100 employes and their families making a total population of 3,000. The operating staff consists of 35 Europeans and 90 Egyptians with an Egyptian labor organization of approximately 1,000 men.

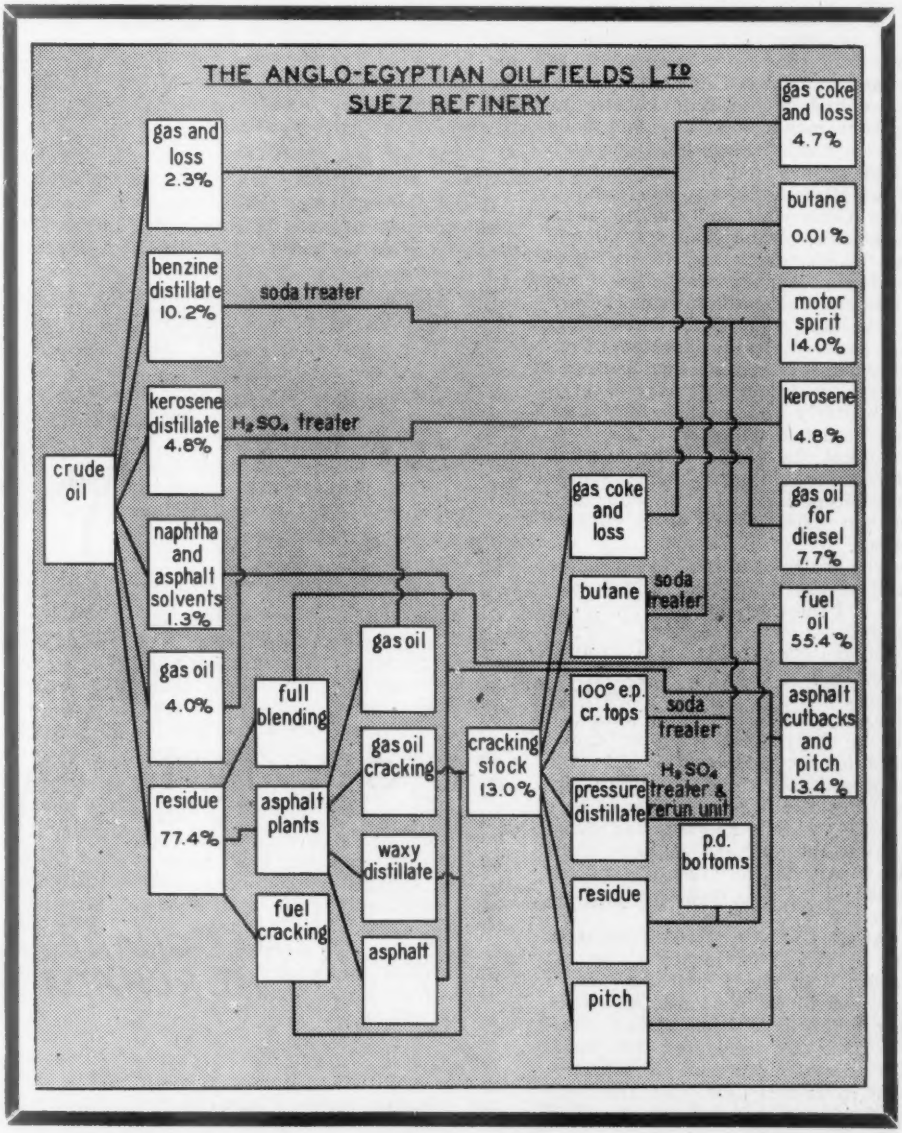
A total of 90 four and five-room modern bungalows of stone construction provides homes for staff employes. A club, laundry, machine shops, warehouses, swimming pool, and all the utilities are part of the operation of this self-contained camp. All water except salt water for drilling is shipped from Suez by tanker. Food and other supplies are also brought to the field by boat from Suez.

The Anglo-Egyptian management for years has conducted all phases of its operations with the objective of employing the maximum number of Egyptians. Most of its employes not only at Ras Gharib but at other points are Egyptians who, in most cases, come to the company without previous experience in the petroleum industry. They have been given training in the offices, shops and other operating phases so that they now furnish most of the manpower in these activities. The drilling crew operating the rig at Ras Gharib is 100 per cent Egyptian.

Geology

Exploration activity in the Ras Gharib area goes back to 1921 and 1923 when two dry holes were drilled a short distance south of the present field. The first test was drilled to 1,285 ft. and the second to 3,270 ft. Drilling was resumed in 1937 based on additional information obtained in a gravity meter survey and the first well of the field was completed as a flowing producer at a depth of 2,560 ft. in 1938.

Product diagram of Anglo-Egyptian Oilfields, Ltd., refinery at Suez



XUM

Egyptian drilling crew in Ras Gharib field

A representative cross-section of the field shows 700 to 1,000 ft. of sands and grits. The next 1,000 ft. are anhydrite and shale. Locally the section includes a limestone body which is now being developed with small settled production in prospect. The Miocene lies unconformably over Cretaceous and Carboniferous beds. Minor sand bodies are found in the Cretaceous with small production. The main production comes from the Carboniferous sands.

The field is generally described as an easterly dipping faulted monocline of pre-Miocene age truncated to the west and south by a series of westerly and southwesterly hading faults forming a single fault complex, the whole being overlain unconformably by a domal mantle of Miocene beds with the main fault system partially reflected in that series.

The bulk of the field's production comes from two sand formations of the Carboniferous beds; one known as the A series, produces from depths varying from 1,800 to 2,300 ft. The C and D series on the upstructure side produce from 1,500 to 2,400 ft. The A series oil is trapped by the nonconformity and the C and D series partially is trapped by the nonconformity and partially by faulting. The two series overlap over part of the field and this has necessitated the drilling of twin wells 29 ft. apart. The thickness of the sands in the two series varies from a few feet to 400 ft.

At present there are 38 wells in the A series, 52 in the C and D series, 8 in the Cretaceous and 5 in the shallow limestone. Only three dry holes have been drilled since the field was discovered. The small Cretaceous production is partially shut in at this time. The limestone production trends toward the Gulf and an offshore location is now being prepared. The development of the limestone production is on an experimental basis and its settled possibilities are not known.

Drilling

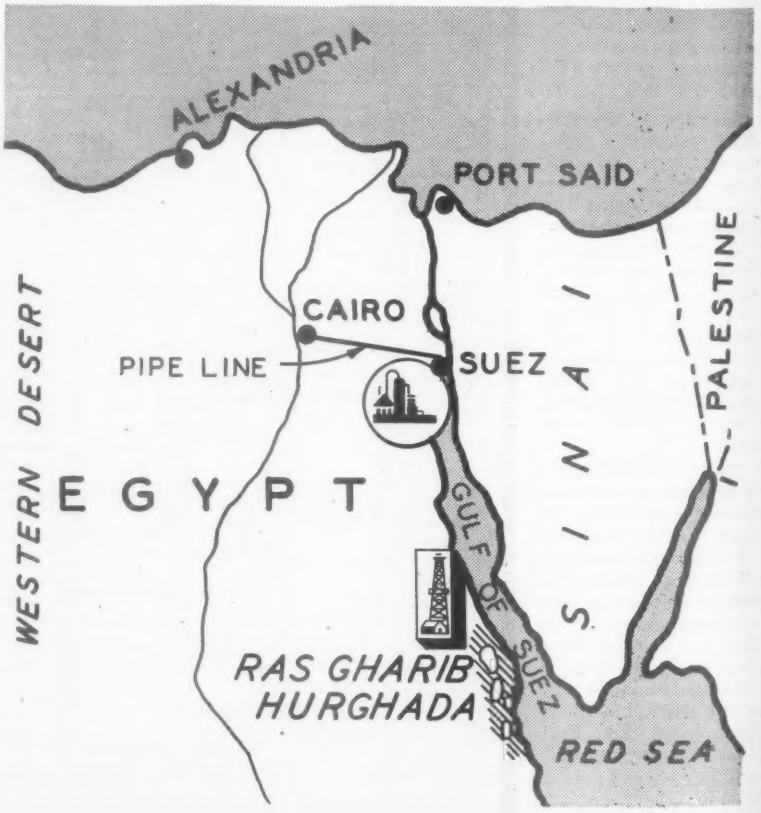
Diesel-powered rigs have been used throughout the development program. With the exception of the upper loose abrasive sands and grits the formations are consolidated and rock bits are used throughout. In some wells trouble has been experienced with lost circulation at depths of 300 to 700 ft. Cotton-seed hulls and raw cotton are used successfully in solving this problem.

In a representative well 250 ft. of 9⅝-in. casing is used with 1,500 to 2,000 ft. of 7-in. which is set at top of the producing formation. A 5⅝-in. liner is ordinarily used for the producing formation. Some wells have been completed without a liner. A local clay and sea water are used for mud. The mud is treated with starch when pay horizons are encountered. Cementing follows conventional practice, with cement brought to the surface or into the shoe of the overlying string.

Production Practices

No unusual practices are involved in the operation of the field which consists of approximately 750 acres and which is about square in area. There are, at present, 26 flowing wells, 13 gas-lift wells, and 42 pumping wells. The wells are individually pumped with gas engines as power.

The wells are usually spaced 700 ft. apart except for the main productive horizons which because of its exceptional thickness has been



Map of Egypt showing location of fields, refinery, and pipe line

further developed by drilling with a five-spot location. The well pressure is entirely hydrostatic with no gas caps.

In the operation of the field approximately 1½ million cubic feet of gas is collected daily. The gas is compressed to 300 lb. Part of this gas is used in the gas-lift operation at a line pressure of 250 lb. after passing through a stabilizer. The excess gases are flared and the heavier liquid fractions from the stabilizer are blended back with the crude oil. Part of the production requires dehydration and considerable experimental work has been done in the field. The present practice incorporates combination chemical-electrical method.

Wildcat Operations

In addition to the Ras Gharib field the Anglo-Egyptian company has two wildcat tests drilling and a third was expected to spud in during November. One string is operating about 15 miles north of Ras Gharib. Another string is drilling 15 miles east of Suez, 1½ miles east of what is known as the Ayun-Musa well which was recently completed as a large water well. A new rig will be used in testing structures on the east side of the Gulf of Suez in the Ras Matarma area.

Refinery

The Suez refinery was originally built to operate as a skimming plant with the Gemsah and Hurghada crude oils. Cracking units were later installed to operate with charging stock from these crude oils.

When it was definitely known in 1938 and 1939 that Ras Gharib was a major field plans were inaugurated to enlarge and round out the operations of the refinery. Unfortunately, the start of World War II in September 1939 brought about a situation in which it was impossible to complete this program because of the lack of material and because of shipping conditions. Additional cracking facilities had been added before the war started. In the main, it was necessary throughout the war period to operate with old equipment and a minimum of construction and maintenance supplies. New equipment and materials for the refinery (and replacements) were in one instance sunk three times by enemy action before deliveries were made at the refinery.

In recent months the management has been able to secure part of the new equipment needed and this is being installed. The company has a long-range program which provides for additional changes in plant processing methods along with an expansion in supporting facilities including a new housing area for staff and labor.

Following are average distillation tests of the Ras Gharib and Hurghada crude oils with which the refinery is now operating:

A.P.I. gravity	25.6°
Flash point, °F.	Below 50
Pour point, °F.	25
Viscosity Engler at 50° C. (90° F.)	2.7
Water content, per cent volume	0.5
Salt content	0.06
Sulfur, per cent weight	2.5

A.S.T.M. distillation (low-range distillation thermometer)

Per cent recovery to:	Hurghada	Ras Gharib
100° C. (212° F.)	3.0	3.5
125° C. (257° F.)	5.0	6.0
150° C. (302° F.)	8.0	9.0
175° C. (347° F.)	12.0	12.0
200° C. (392° F.)	15.5	16.0
225° C. (437° F.)	19.0	20.0
250° C. (482° F.)	22.0	24.0
275° C. (527° F.)	26.0	28.0
300° C. (572° F.)	32.0	33.0
Residue, per cent	67.0	66.0
Loss, per cent	1.0	1.0

These distillation data indicate the processing difficulties inherent in the crude oil. The low gravity is reflected in the low benzine (gasoline) yield obtained in the primary distillation. The high sulfur content and the H_2S gas complicate the treating problems and when combined with salt-water emulsions in the crude results in corrosion problems.

Despite these difficulties those in charge of the refinery before the war were able to manufacture products which supplied a large part of the domestic market. During the war certain phases of the specialty operations were expanded to secure products required by the military. The refinery was a large supplier of asphalt products during the war.

The accompanying chart was prepared to show quickly the main features of the present operation and the percentage yields obtained in the topping operation and the percentage yields of finished products which include topping, cracking, and asphalt extraction.

The present crude-oil-distillation equipment consists of two redesigned Trumble units with the old-type Trumble furnace, five Coalinga furnaces, and one Lummus heater. These units are operated in parallel connecting to one fractionating unit. A larger Lummus unit is now being installed. This unit will be operated with its own fractionating equipment. The other Lummus heater and three of the Coalinga furnaces will be operated with the existing fractionating equipment. The remaining two Coalinga boilers will be used as reboilers. The old-type Trumble unit and its furnace will be scrapped.

The first Dubbs unit is used for fuel-oil cracking as shown in diagram "fuel cracking." The other Dubbs unit is a modern two-coil operation with gas oil and wax distillate as charging stock. The operation includes a rerun operation for the pressure distillate and depropanizer and debutanizer in the stabilization operation. Part of the butane output is bottled and sold in local markets. Facilities are also provided for the manufacture of a special grade of pitch from the Dubbs residuum. This also supplies a local market.

Particular attention is paid to the manufacture of asphalts and cutbacks for which the crude oil is particularly suitable. About one-third of the residuum from the skimming operation is used in the manufacture of these products. The method of manufacture follows general practice with both atmospheric and vacuum stills used. The refinery manufactures its own drums for packaging the asphalt.

The manager of a refinery of similar size in the United States would be surprised at the scope of the supporting facilities necessary at the Suez refinery. The refinery can draw on practically no outside services in the repair and maintenance of equipment. The refinery has a complete machine shop including facilities for forging. Because new supplies have not been available the maintenance department often time has to duplicate in its machine shops existing equipment that has worn out.

The expansion of the refinery during the war period, and requirements for additional tankage as well as quarters for staff and labor make it urgent for the company to acquire more land near its present refinery and negotiations are now proceeding with the appropriate government departments.

Unit Oil Corp. Acquired By Sinclair Wyoming

DENVER.—Sinclair Wyoming Oil Co. has purchased all the stock of Unit Oil Corp. controlled by R. S. Shannon and associates of Denver. This company owned approximately 15 per cent of the Sand Draw oil unit consisting of 1,780 acres, completely unitized. The property is in Freemont County, Wyoming, and the production in the unit comes from the Tensleep sand. Sinclair Refining Co.'s pipe line carries the oil from the field to the refinery at Sinclair, Wyo.

Stanolind Posts Price for Little Buffalo Basin

Stanolind Oil & Gas Co. has posted a price of 65 cents a barrel for crude oil produced in the Little Buffalo Basin field, Wyoming. The posting is effective as of January 8, 1945. The oil comes from the Embar-Tensleep.

XUM

INTERNATIONAL

Norway Has Oil Products For Its Immediate Needs

OSLO. — Norway's stocks of oil products are sufficient for essential purposes. Driving for pleasure is still prohibited, to conserve automobiles, tires, and batteries and to avoid the loss of foreign exchange.

Importers of petroleum products are pooling orders through an importers' committee under Government supervision as an interim arrangement between complete Government control and private importation.

The present government control consists primarily in the rationing of foreign exchange. The retail price of gasoline is 1.08 crowns per liter (about 82 cents per gallon). Of this price, 0.95 crown represents a tax, the proceeds of which are used mainly to subsidize the processing of wood fuel for automotive producer-gas generators. Government officials say it is probable that the price will be reduced to 0.50 crown by the beginning of 1946, when producer gas is expected to be replaced by gasoline as fuel, making the subsidy unnecessary.

Oil Production Resumes On Tarakan

Oil production in the Tarakan fields off Borneo, first territory in the Netherlands Indies to fall to the Japanese, has been resumed on a limited scale, according to Batavian Oil Co. No estimate was made for 1945 output, because full-scale production has been made impossible by the destruction of field equipment and storage facilities.

When the Japanese invaded Tarakan in January 1942, the Dutch garrison destroyed most of the existing wells and storage tanks. During the Japanese occupation, American bombers struck the fields in November 1944. The Japanese attempted to follow a "scorched earth" policy when the island was invaded by the Allies this year. However, an examination revealed that one-third of the wells in the Pamusian area were not destroyed, and almost half the new wells bored by the Japanese were in operating condition.

In 1940, crude-oil production amounted to 807,821 long tons, but dropped to 698,284 in 1941. Boring was continued throughout 1940 because of the demand for oil but lack of cargo space limited production in 1941. The company noted that despite the Dutch destruction and American bombing, the Japanese succeeded in operating the wells and even drilled 140 new wells.

Mexico Pays United States Installment of $2,500,000

MEXICO CITY. — The Mexican Government has paid to the United States its fourth annual installment of $2,500,000 in accordance with the agreement concluded November 19, 1941, in settlement for oil properties owned by United States citizens and expropriated by Mexico.

Under the terms of the convention, Mexico agreed to pay the United States $40,000,000 in settlement of oil claims. Payments previously made amount to $13,500,000. The balance amounts to $24,000,000, to be liquidated over a period of years by the annual payment by Mexico of not less than $2,500,000.

Ceylon's Imports of Fuel Oil Rise in Second Quarter

COLOMBO.—Ceylon's imports of fuel oil rose to 59,529,010 imperial gallons, valued at 19,004,754 rupees, during the second quarter of 1945, from 41,296,686 gal. valued at 13,174,879 rupees, in the first. The Ceylon rupee is equal to about 30 cents.

Imports of kerosene increased to 2,989,214 gal., valued at 696,289 rupees, during the period April-June 1945 from 684,946 gal., valued at 535,879 rupees, in the first 3 months of the year. Lubricating-oil imports declined slightly, from 124,292 gal. in the first quarter to 118,720 in the second, values being 224,126 and 237,548 rupees, respectively.

Gasoline imports totaled 3,680,549 gal., valued at 1,565,600 rupees, during the second quarter, compared with 5,260,345 gal., valued at 2,021,078 rupees, during the January-March period.

Mexico's Oil Production Increases 20 Per Cent

MEXICO CITY. — Mexico's production of crude oil in the second quarter of 1945 was about 20 per cent higher than that in the first. Output in the second quarter was 11,172,153 bbl. compared with 9,361,728 bbl. in the first 3 months of the year.

These compare with 9,957,014 bbl. in the first quarter of 1944 and 8,610,865 bbl. in the second quarter.

Exports in the second quarter of 1945 increased more than 100 per cent, amounting to 2,397,069 bbl. as against 1,131,075 in the first quarter. During the first and second quarters of 1944 exports were 1,257,446 and 1,640,856 bbl., respectively.

In the begnning of the quarter there were gasoline shortages throughout the country, but particularly in the states of Sinaloa, Nayarit, Tamaulipas, and Neuvo Leon. These shortages resulted from inadequate transportation facilities and from increased consumption of petroleum products, which during the first quarter of 1945 was estimated at more than 75,000,000 liters of Mexican-produced oil monthly. During the latter part of June, however, gasoline and fuel oil were available in sufficient quantities in most parts of the country.

Hydrogen Peroxide Used In Making Power Fuel

BERLIN.—A report on the development by German chemists of concentrated hydrogen peroxide solutions for use as power fuel in submarines and rockets has been prepared. The report, which has been placed in the hands of the U. S. Department of Commerce, says that the process, a method of concentrating 35 per cent solutions of peroxide to 80 per cent or higher, was perfected by the Elektrochemische Werke at a plant near Muenchen. The fuel was also used to assist takeoff units for aircraft and in torpedoes. The experiments conducted by the German plant are described in the report.

Oil Industry to Finance Penal Institutions

BOGOTA.—A bill introduced in Congress by Sen. E. Caballero would have the oil industry finance construction of modern penitentiaries and jails throughout Colombia. Funds acquired from lump-sum payments of 1 and 2 pesos per hectare (2.471 acres) upon granting of oil concessions would be earmarked for the project. An estimate based upon reports of the minister of oil indicates that 15,000,000 pesos ($8,100,000) would be needed to execute this ambitious scheme. Caballero says the country is in "utmost need" of the new penal institutions.

Plan for Oil Refinery in Tripoli Is Ratified

BEYROUTH, Lebanon.—The Lebanese chamber of deputies has ratified the Lebanese-American agreement for establishing an oil refinery in Tripoli.

XUM

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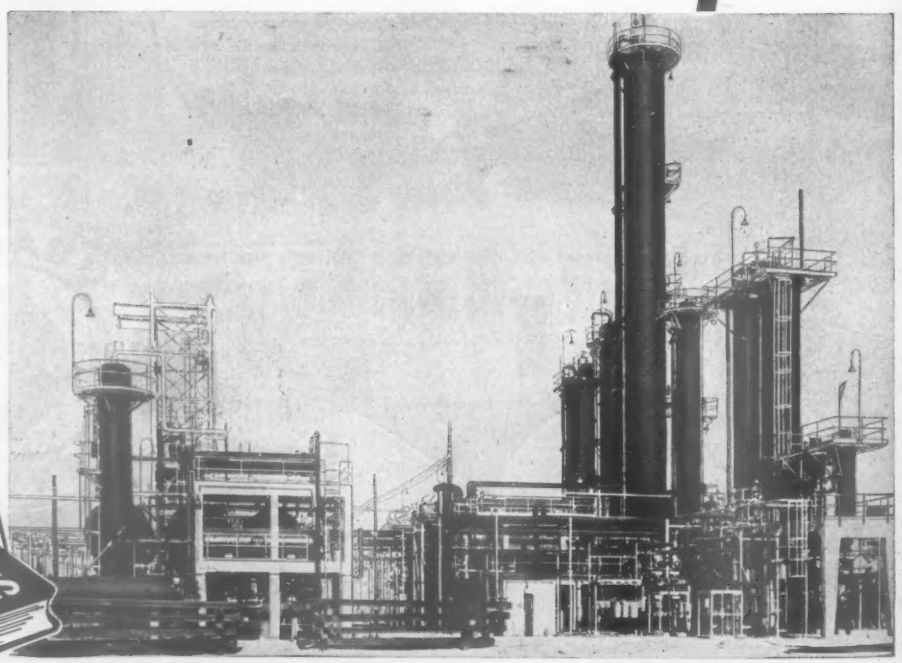

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Ickes Urges Centralization of Oil Activities in Interior Department

WASHINGTON.—Centralization of all government oil activities within the Department of Interior was advocated last week by Secretary Ickes, who said that he hoped this would be one result of the now pending federal reorganization bill.

Ickes told a press conference that he saw no need for a coordinating agency for oil established separately at cabinet level. "What do you want," he asked, "a secretary of oil?" Nor should the industry have to deal with the military, he added. "It will be a sorry day when we have to turn to the military to perform civilian functions."

Pointing to wartime super secrecy on the part of the Army and Navy, Ickes said that he had not been consulted on the Canol project, was never kept advised of the stock position of the Army or Navy, and was never told how many U.S. tankers were being sunk in the days of the serious submarine losses.

"We did learn these things indirectly from the British," he said. "I once told an admiral that if I wore an ensign's uniform instead of being just the Secretary of the Interior, I might have been trusted with some of the momentous secrets." In spite of lack of cooperation from the services and energy wasted in "keeping ambitious young executives" from whittling away his authority, Ickes said that he was willing to take credit for bossing the most successful Washington war agency, Petroleum Administration for War.

Ickes said he had not conferred with any member of the oil industry on postwar government and industry cooperation nor had any study of the economics of storing crude oil from abroad in depleted domestic fields been completed. Of the latter, he said, "I hope somebody is working on that problem, but PAW is liquidating so fast that there won't be anybody to do it."

With the Anglo-American oil treaty still awaiting Senate committee hearings, now tentatively scheduled for January, there would be little point in submitting legislation to create an oil commission to carry out the provisions of the treaty, Ickes said. A draft of such a bill is being prepared, for submission after ratification of the treaty.

Also in preparation within the department is a memorandum covering the problem of stripper wells, Ickes said, and cited his continuing interest in the operation of such wells as those producing Pennsylvania crude. He reiterated previous statements that a price structure designed to encourage stripper production is the first requisite to keeping them open.

The General Land Office is working on policies and procedures to cover Continental Shelf activities, Ickes said, and the tidelands question is now strictly up to the Supreme Court where, he said, it belongs.

He also urged strong conservation laws for California—no state needs them more—and criticized industry executives who oppose them.

Navy's Oil Plan Outlined Before Congressional Committee

WASHINGTON.—The Navy's position with relation to a national oil policy was presented to the Senate petroleum resources committee last week in a formal statement by Commodore W. G. Greenman, director of Naval Petroleum Reserves.

Greenman explained that the statement had been approved by the Secretary of the Navy and all branches of the department, and was also concurred in by the War Department.

This policy statement carried little from the position taken by spokesmen for the oil industry and the Petroleum Administration for War when testifying before the O'Mahoney committee except that the Navy was firm in its insistence that it be permitted to retain and develop its petroleum reserves in Elk Hills, California, and in Alaska. The other two reserves, at Teapot Dome, Wyoming, and Buena Vista Hills, California, Greenman said, are of no importance to the Navy and could well be disposed of.

In his prepared statement Commodore Greenman said:

"It would be well to emphasize that no plans are being formulated for acquiring any additional naval petroleum reserves from private lands or from government lands. The over-all sustainable and available productive capacity of the nation's oil industry is the prime concern of the armed services.

"The Navy has four Naval Petroleum Reserves, but only two are of any future potential military importance, namely, Naval Petroleum Reserve 1 in California, and Naval Petroleum Reserve 4 in Alaska. Reserve 1 is of value, not for the volume of producible oil, which is relatively small in the over-all picture, but because of its strategic location on the Pacific Coast where discoveries of new reserves have not kept pace with the volume of withdrawals and to which the transportation of petroleum is relatively difficult. The value of Reserve 4 is, of course, entirely problematical. Therefore, it becomes of great importance in planning for the future that the volumetric content and productive capacity of these reserves be determined, in order that they will be ready to serve as a strategically located supplemental source of oil in time of national emergency. In connection with the reserve in Alaska, even if oil is found in commercial quantities, there will still remain many engineering and economic problems to be solved before its availability to our West Coast refineries can be assured.

"In establishing a national oil policy, it is proposed first, that future military petroleum requirements be correlated with those of industry, and industry undertake to provide the resources to insure the availability of production ample to meet the requirements for a future war; second, that the technological studies looking to the determination of the most satisfactory methods for the economic commercial development of synthetic fuel be vigorously pursued; and third, that the Navy explore its reserves to determine their volumetric content and sustained productive capacity. In the expansion of industrial resources, both at home and abroad, the government must lend all possible aid. In the field of synthetic fuels, particular encouragement must be given industry by the government to stimulate technological development, and as required, to the construction by private enterprise of facilities to insure production ample to supplement or replace petroleum products. In return it will be incumbent upon industry to cooperate by giving concrete assurance of its ability on short notice to provide the oil or its substitutes in ample quantities in time of emergency.

"Fortunately, the American oil industry has acted with great foresight and enterprise in developing very large oil resources under Amer-

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ican control in different parts of the world. With respect to these foreign oil holdings of United States nationals, it is important that the government support the expansion, development, and protection of such interest, including marketing outlets, by endeavoring to create and maintain in foreign oil-producing countries a healthy and friendly political climate, and that it encourage new ventures in foreign fields. The government should not, of course, assume the commercial risks inherent in new business enterprises, but should do everything in its power in the international political field to make it possible for its nationals to engage in legitimate business. The enlarged production of oil abroad can make the largest contribution to the conservation of our own resources by lightening the burden upon them. It is not meant by this that oil should be imported into this country if such importation results in any diminution in the incentives that should exist here to encourage the search for oil or in any narrowing of those profit margins that furnish the funds for vigorous domestic exploration. To summarize, there are three fundamental principles involved in the support of the foreign oil holdings of United States nationals if they are to be of real value in times of emergency:

"1. They should be owned or controlled by nationals of the United States.

"2. The United States Government should maintain friendly international relationships in their support.

"3. The military strength of the United States should be sufficient to protect the lines of communication to the countries in which they are located.

"If any one of these is lacking, the whole structure falls."

Draft Deferment Proposed for Research Workers and Students

WASHINGTON. — In a move to protect men with high technical and scientific qualifications from further encroachment by the draft, national headquarters of Selective Service last week announced a plan for occupational deferment for students, teachers, and research workers in physical science and engineering fields.

A memorandum to local draft boards requests serious consideration for deferment of registrants certified as "essential to the national interest in a civilian capacity" by the Office of War Mobilization and Reconversion. The following registrants may be so certified:

1. Candidates for master's or doctor's degrees in physical sciences and engineering from accredited colleges or universities.

2. Teachers in the same field in accredited colleges or universities.

3. Registrants who are to be employed or attached to the staffs of accredited colleges and universities for research in the specified fields and who signify their intention to engage in such research. Certifications on a research basis will be given only if the work to be undertaken "contributes significantly to the national interest and if inability of the registrant to undertake the research will result in its delay."

Draft registrants seeking certification should file, in triplicate, to OWMR in Washington notarized statements of intentions to enter graduate studies or engage in teaching or research in the stated fields. This is to be accompanied by a statement from the college or university corroborating the applicant's statement and the registrant's name, address, age, selective service local board number and address, classification and educational qualification.

Undergraduate Requirements

Undergraduates who have completed at least 3 years of work leading to B.A. or B.S. degree in physical science or engineering may also be certified for deferment if they have served for at least 2 years in a project directly connected with the war effort. Such applicants for deferment should file similar notarized statements of intention to continue studies, plus corroborative statement from the college or university, statement of name, address, etc., and a statement from the registrant's employer that he has been engaged for at least 2 years in scientific war work.

The plan was developed by a committee on deferment and selective release which is composed of representatives of the Office of Scientific Research and Development; Civilian Production Administration; Office of Rubber Reserve; Petroleum Administration for War; War and Navy Departments; United States Employment Service; Office of Education; National Roster of Scientific and Specialized Personnel; Selective Service Commission. The chairman is an OWMR representative.

Three-Man Panel Would Act in Wage Disputes

WASHINGTON. — A fact-finding procedure in the refinery wage dispute, which may set a pattern for general industrial application as recommended by President Truman, got under way this week with initial meetings of a three-man panel to make recommendations for settling the wage dispute which resulted in seizure of oil refineries by the Navy.

The panel was appointed by Secretary of Labor Lewis B. Schwellenbach with instructions to make a report by December 27. It consists of Dr. Frank P. Graham, president of University of North Carolina and member of the War Labor Board; Paul Eliel of Stanford University, and Otto Beyer of Washington, a labor adviser formerly with the Department of Labor.

The panel met this week to outline procedures, and may hold public hearings. It is directed to find the facts underlying the dispute and to make recommendations as to the rates of wages which should be paid when the refineries resume a 40-hour week. The order specifically states that the companies may present data on a company or plant-by-plant basis, whereas the International Oil Workers Union had contended that the wage dispute should be settled on a nation-wide basis.

President Truman, in a special message to Congress Monday, asked for legislation setting up similar fact-finding panels, representing the public interest, wherever any labor dispute threatens production in a major industry of national importance. Success of the oil-refinery panel may well set the pattern for such legislation and the settlement of other similar labor disputes.

Socony-Vacuum Travelers Take to the Air

NEW YORK. — Socony-Vacuum Oil Co., Inc., has acquired its own fleet of airplanes to carry aviation-department salesmen and other company representatives on their business trips. The planes are 2 to 14-place cabin models with engines up to 1,200 hp.

Introduction of the pilot-salesman is ushering in a new era in American business methods, and setting a course that will eventually be followed by all progressive firms, the company predicts, adding: "It's just as incongruous for an aviation salesman to travel in anything except a plane as it would be for an automobile salesman to go about with a horse and buggy."

BAASH-ROSS TOOL CO.

Baash-Ross News

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OUR 25th YEAR

BAASH-ROSS KAMMERDINER JARS

combine ALL these important features in one tool!

Blow is instantly variable at any time!

In the Baash-Ross Kammerdiner Jar the force of the blow is not only instantly adjustable from the surface (no need to pull the tool to vary the blow!) ... *but the adjustment can readily be made at any time in the operating cycle.*

This feature is of utmost importance. Should you start to take too heavy a blow, you don't have to complete the stroke before re-adjusting. At *any* time in the operating cycle — right up to the point where the blow is actually struck — you can instantly adjust for either greater or less force in the jarring action, whichever you want!

Packed off for high circulation pressures!

And here's another feature that increases the utility of the Baash-Ross Jar ... It is fully packed-off so that high-pressure circulation can be maintained through the tool to other equipment below. Thus, these Jars can be run with formation testers and similar tools with the positive assurance that high circulation pressures can be applied at any time. This feature can also simplify certain fishing jobs where it is desired to use circulation pressure as well as jarring action to loosen the fish!

Simple, rugged, fool-proof design!

There are no delicate parts, no tricky mechanisms, no critical adjustments to worry about in the Baash-Ross Kammerdiner Jar. Its parts are few and are ruggedly proportioned to assure the maximum in trouble-free service. From top to bottom it is built for sustained *hour-after-hour* jarring on the toughest kind of fishing jobs!

And this is a cost-cutting feature for export users — the Jar can be quickly renewed by simply replacing the mandrel and sleeve. There's no wear on the body. It lasts indefinitely!

Leased in U.S.A. Sold for export only

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No HYCAR packer in a Lamtex pump has ever worn out!
Below, new HYCAR packer for Lamtex Casing pump. This pump lifts fluid through casing string rather than through string of tubing.
Above, HYCAR packer for Lamtex pump removed after 15 months' service and five round trips in 3500' Oklahoma well. Note excellent condition except for scratches from rusty casing. Removed from service because it had lasted so long the operator thought it should be worn out!

Photo courtesy Lamtex Equipment Co.
Hycar parts by Murray Rubber Co.

NO signs of deterioration in oil or gas; no sticking to casing walls; no permanent set—packer springs back into shape when pressure is removed; no evidence of abrasion except when used in rusty, corroded casings; the best material he has ever used!

These are a few of the things said about HYCAR packers used in Lamtex pumps by one Oklahoma operator who knows the answers.

They're typical of remarks made about many different kinds of HYCAR parts in the oil fields—casing head seals, slush pump packers, mud line valves, hose, gaskets and seals, and many others. The properties in the list at the right tell why HYCAR has become practically the standard resilient material for oil field use. Its applications extend to every part of the oil industry—producing, refining, transportation, and marketing.

Ask for parts made from HYCAR for test in your own applications—difficult or routine. You'll learn for yourself that it's wise to use HYCAR for long-time, dependable performance. *Hycar Chemical Company, Akron 8, Ohio.*

WHAT HYCAR DOES IN OIL FIELD APPLICATIONS

1. *Resists oil and gas—even under high pressures and temperatures.*
2. *Resists action of abrasive-laden fluid under high pressure and at high velocity.*
3. *Wears at slow rate even under worst conditions.*
4. *Makes a positive, leak-proof seal, even after a long period of service.*
5. *Provides high elasticity.*
6. *Gives high tensile strength.*
7. *Has minimum tendency to cold flow and compression set.*

Hycar

Reg. U. S. Pat. Off.

LARGEST PRIVATE PRODUCER OF BUTADIENE TYPE

Synthetic Rubbers

Engineers Discuss Dimethyl Silicone Fluids at A.S.M.E. Meeting

by Fabian R. Staley

NEW YORK.—The oxidation stability, low viscosity-temperature coefficients, and freedom from fire hazard of dimethyl silicone fluids present definite advantages in operation, the American Society of Mechanical Engineers were told here last week at the annual meeting. The discussion of dimethyl silicone fluids was presented by J. E. Brophy, R. O. Militz, and W. A. Zisman, all of the Lubrication Section, U. S. Naval Laboratory, Washington.

However, use of these fluids in lubricants for steel or cast-iron surfaces is not promising, it was pointed out. Before they can be lubricated with the dimethyl silicone fluids, surfaces must be "lacquered" by immersion and then baked at a temperature near 400° F. The tendency of these fluids to creep presents leakage problems when they are used in hydraulic systems.

Coordinating data from 10 investigations of the viscosity of lubricants under high pressure, Mayo D. Hersey and Richard F. Hopkins conclude that further experimentation is needed in (1) increasing the pressure range, (2) widening the temperature limits, and (3) taking into account the rate of shear or its equivalent as an independent variable. Lubricants as an engineering material were discussed by C. L. Pope, who said that "it behooves the engineer to face the matter of lubrication as he would a choice of materials or an option of designs."

Materials of Construction

Economic engineering involves the selection of materials so that their application will produce the resultant structure for the least total cost in the service to be undertaken considering the safety of operations and the life of the plant, according to an address by T. McLean Jasper of General American Transportation Corp. He stated also that drilling operation in the future will go to greater depths, and will require engineering materials of increased strength and resistance to abrasion, fatigue, and corrosion. The alloying elements in steel that will increase strength most economically are manganese and carbon. In casing the least expensive method when necessary for increasing collapse resistance is cold compression of the tubes in the transverse direction. For resistance to abrasion the most important alloying materials for drilling operations are manganese, molybdenum, and tungsten. A proper combination with carbon is important also. Abrasion resistance requires a combination of properties involving toughness, resilience, and surface hardness.

Dr. Jasper said also that the refinery is becoming a chemical plant to an even greater extent, with all of the problems of such a plant. As the synthetic products of refining become increasingly available the question of combating corrosion of the container and the deterioration of the product becomes more important. Solvents as well as other products used for plastics sometimes require the use of aluminum. The teaming of steel with other materials for corrosion resistance, since steel is the most economical material that can be employed for carrying heavy loads, is applying economic engineering principles.

He further stated that the application of materials to the problems of refining calls for a greater knowledge than that associated with production or transportation. Refining demands high temperature and high-pressure operations. Many refining processes are also associated with low-temperature operations and these tend to reduce the working pressures at which the low temperatures are effective. Little is known about fatigue at high or low temperatures except that at high temperatures the values are reduced and at low temperatures the values are increased but the materials have a greater tendency toward brittleness.

Alloys for Resisting Corrosion

It is convenient to consider refinery corrosion as possessing two different identities, according to B. B. Morton of The International Nickel Co., Inc., the dividing line being the temperature level at which water is no longer present. An arbitrary figure of 500° F. has been taken. Above this temperature "dry" corrosion is considered to take place due to the action of sulfur and also some organic acids. Below this temperature "wet" or electrolytic corrosion is assumed to take place. A general solution to the two distinct types of corrosion occurring

TABLE 1—GALVANIC SERIES OF METALS AND ALLOYS*

Corroded End (anodic, or least noble)

Magnesium	Nickel (active)
Magnesium alloys	Inconel (active)
Zinc	Brasses
	Copper
Aluminum 2S	Bronzes
	Copper-nickel alloys
Cadmium	Monel
Aluminum 17ST	
Steel or iron	Silver solder
Cast iron	
	Nickel (passive)
Chromium-iron (active)	Inconel (passive)
	Chromium-iron (passive)
Ni-Resist†	18-8 Chromium-nickel-iron (passive)
18-8 Chromium-nickel-iron (active)	18-8-3 Chromium-nickel-molybdenum (passive)
18-8-3 Chromium nickel-molybdenum-iron (active)	Silver
Lead-tin solders	Graphite
Lead	Gold
Tin	Platinum

*By B. B. Morton, The International Nickel Co., Inc. Presented at the annual meeting, New York, N. Y., November 26-29, 1945, of American Society of Mechanical Engineers. †Reg. U. S. Pat. Off.

TABLE 2—STUDY OF ALLOYS IN ISOMERIZATION UNITS§

Corrosive—Hydrochloric gas and acid
Process—Isomerization of butane
Duration—1,050 hours
Temperature—240° F. average

	Spool No. 1 (tar)		Spool No. 2 (vapor)	
	Corrosion rate in./yr. (av.)	Pitting during test (in. surface, max.)	Corrosion rate in./yr. (av.)	Pitting during test (in. surface, max.)
Monel	0.0261	.....	0.0243	.004
Nickel	0.0095	.....	0.0128	.010
Inconel	0.0106	.....	0.0120	.002
18-8 Stainless	.....	*.002	.....	.008
Type 304	0.0945	†.002	0.0500	.010
18-8 Mo stainless	.....	.....	.....	.006
Type 316	0.111	.....	0.048	.004
Hastelloy B	0.0004	.....	0.0008	.....
Silver	0.0479	Perf.	0.065+	Entirely corroded
Copper	0.13+	Entirely corroded away	0.0438	.003
85-5-5-5 Bronze	0.145	.....	0.0580	.....
Ni-Resist	0.0525	.....	0.0515	.....
Mild steel	0.165	‡.005	0.0810	.002
Cast iron	0.085	.....	0.0826	.....

*One-half of spec. corroded away. †One-third of spec. corroded away. ‡One-eighth of spec. corroded away. §By B. B. Morton, The International Nickel Co., Inc. Presented at annual meeting, New York, November 26-29, 1945, of American Society of Mechanical Engineers.

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"Oilwell" SWIVELS GIVE YOU 10 IMPORTANT ADVANTAGES

. . . and the choice of a complete line for all drilling requirements

No. 60-C
*Depths to—
5,700 feet
at 100 r.p.m.
100-ton rating

No. 100-C
*Depths to—
8,500 ft.
at 100 r.p.m.
200-ton rating.

No. 150-C
*Depths to—
12,500 feet
at 100 r.p.m.
300-ton rating.

No. 300-C
*Depths to—
17,000 feet
at 100 r.p.m.
400-ton rating.

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ratings w
4½-in. d
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THE two deepest wells in California were drilled with "Oilwell" Swivels . . . and a large share of California's wells of all depths are being drilled with this dependable, long-lasting equipment. Whatever your requirements may be, you will find in the complete "Oilwell" line a swivel of ample capacity and efficient size for the job. Note these 10 important features:

Heavy-duty roller bearings—Main bearing is of the full-apex type, especially designed for its application and proved by its outstanding service records. Wide spacing of the two bearings carrying the radial load assures maximum stability.

Circulating oilbath lubrication—All bearings are constantly immersed in a continuously circulating bath of lubricating oil.

Heat-treated forged-steel body with integral tool-joint pin—Large-diameter fluid passage. A left-hand A.P.I. tool-joint pin is cut directly on the body, with ample stock for re-threading.

Di-Hard wash pipe—Abrasion-resisting lining of Di-Hard bonded to the inside protects the wash pipe from the cutting action of the fluid. A ground-and-polished armor of Di-Hard bonded to the outside greatly extends the wear-life of both wash pipe and packing.

Self-sealing wash-pipe packing—Requires no adjustment. A convenient fitting facilitates lubrication with waterproof grease.

Streamlined one-piece cast-steel housing—Provides rigid support for all working parts and prevents distortion under heavy loads.

Shock-absorbing and wear-preventing link-rest pads—Protect the swivel and the links from destructive hammering of metal against metal.

Large-diameter heat-treated forged-steel bail—One-piece construction with increased thickness at the top to compensate for hook-wear and give extra strength.

One-piece cast-steel housing cap—Provides utmost accessibility to the wash-pipe stuffing box.

Long-Radius heat-treated cast-steel gooseneck—Enlarged fluid passage at bend decreases fluid velocity. This feature combined with long radius reduces flow-restriction and fluid-cutting.

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in a petroleum refinery was outlined as follows:

1. Elevated temperature (above 500° F.).—Chromium is the metallic element most useful to resist the action of sulfur. The necessary concentration of chromium in the metal appears to depend upon the temperatures used and the concentration of the sulfur compounds; also the nature of these compounds. Metals showing resistance to sulfur which are in wide use are listed in descending order as follows:

18 per cent chromium, 8 per cent nickel.

11-14 per cent chrome steels.

4-6 per cent chrome steels.

The variety of mechanical properties of the alloys as well as their corrosion resistance dictate the choice of alloys.

Where naphthenic acids are a source of corrosion at temperatures above 500° F., the following alloys are employed:

Inconel (approximately 80 per cent Ni, 3 per cent Cr).

Type 316 (approximately 18 per cent Cr, 15 per cent Ni, 2-3 per cent Moly.).

2. Low-temperature corrosion (below 500° F.).—Corrosion occurring within the temperature region below 500° F., is considered to be electrolytic in character. It is assumed that liquid water is present to form an electrolyte. The solution to the corrosion of this type is more difficult than in the case of corrosion at elevated temperature, due to the complex nature of the attacking agents. No single element is effective against corrosion at low temperature.

The use of nonferrous alloys to combat electrolytic corrosion is widespread as will be evident in the consideration of material used in parts of refinery equipment exposed to corrosives.

"Nonsense" Says Holman of Gloomy Oil Prophecies

"Anybody who imagines that our oil supply will perish in the next decade, or even in the next 100 decades, is all wrong," declares Eugene Holman, president of Standard Oil Co. (New Jersey), in an article in the current issue of The American Magazine. "Our prophets of national impoverishment have been broadcasting the prediction that we shall have no more oil in 12 to 14 years. This is utter nonsense.

"Large areas remain to be explored. Underwater drilling is in its infancy—merely because it has not been necessary, since we are still not short of oil, in spite of alarmists. The life expectancy of our gasoline supply cannot be gaged alone by the volume of petroleum available in the next 100 years, nor even by petroleum substitutes. It is possible to produce more than 1 bbl. of gasoline from a barrel of petroleum by adding hydrogen. You can dig up asphalt from the street and convert it into gasoline by adding hydrogen.

"The gasoline yield of petroleum, through improved cracking processes, is about 40 per cent. The remainder of the petroleum is used for numerous products. We can easily step up the gasoline yield to 50 or 60 per cent.

"The announced reserve of the petroleum industry represents only a conservative estimate of the known quantity of oil in present fields. When the great East Texas field was discovered 15 years ago its reserves were estimated in the millions. Today its reserves are in the billions of barrels. In many oil fields in which recovery was low we can go back with new techniques. We can get a 'second crop.'

"On purely business grounds the oil industry has less concern over the failure of supply than over development of atomic power. When we begin to run engines economically on atomic energy, oil will become a secondary source of power. By that time it is likely that oil will have created a new industry for itself as a source of chemicals and special products; it will change its outlet, not lose it. There will be plenty of oil."

Industry Can Thrive Under Free Enterprise

(Continued from page 58)

struction and rehabilitation abroad during the next few years.

"Natural Gas and Its Products During the War," by James E. Pew, director of the natural-gas and natural-gasoline division. Before the war the natural-gasoline industry was subservient to the oil refining industry, but now it has been discovered that valuable hydrocarbons can be extracted from natural gas and the construction of condensate plants has expanded rapidly. Our known natural gas reserves have increased tremendously during the war. The natural gas industry has a bright future in the production of many synthetic chemicals, and Pew estimated it could produce synthetic gasoline to compete with crude at $2 per barrel.

"Wartime Petroleum Supply," by Roy F. Hawkins, director of foreign supply and distribution. Hawkins outlined the way in which all foreign operators pooled their activities under government direction, but he emphasized that this procedure should be completely reversed now that the war is over and that foreign activities should be entirely competitive.

"Wartime Petroleum Supply and Transportation," by George A. Wilson, director of supply and transportation. After explaining the revolution in overland oil transportation necessitated by loss of the industry's tanker system, Wilson concluded that a return to prewar transportation methods and competition will fully meet all requirements.

Chairman O'Mahoney told Wilson that he and the other speakers had described a truly magnificent achievement by a state-managed economy and asked why this was not an argument for continuing the system. Wilson replied that it was "just a minimum amount of state management" and that the job was done by willing cooperation of the industry with "just a little assistance" from PAW, adding that he did not want to see any part of it continued postwar but if it ever becomes necessary for the Government to manage it should always have the advice and assistance of the industry.

DEATHS

Harvey Shaffer, 85, pioneer Pennsylvania oil operator and drilling contractor, died in Mercer, Pa., November 25.

C. C. Newton, 60, district construction superintendent for Humble Pipe Line Co. at Midland, Tex., died November 17. He was with Humble 25 years.

R. P. Ironside, 58, attorney for Sinclair Prairie Oil Co. for the past 20 years, died November 29 in Tulsa.

Harold C. Green, 56, head of the Levant division of Socony-Vacuum Oil Co., Inc., and former manager of the company's operations in Smyrna, Syria, Yugoslavia, and Istanbul, died November 27 at his home in Plainfield, N. J. He graduated from Trinity College in 1910.

Frank C. Comstock, 58, of Knapp Creek, N. Y., oil producer and drilling contractor in the Bradford, Pa., area, died November 27.

Edward L. Biersmith, Jr., 45, plant manager for Columbian Steel Tank Co., Kansas City, Mo., died November 24. He was a graduate of Notre Dame University.

Carl Weinhauer, 63, oil producer, of Wellsville, N. Y., died November 28 from injuries suffered a few hours earlier in an automobile accident.

C. J. Etzel, 88, drilling contractor until his retirement 3 years ago, died November 28 in Shippenville, Pa.

Oklahoma at Important Threshold With New Deep Pools

Need of Wider Spacings and Pressure Maintenance Operations Strongly Shown

by Kenneth B. Barnes

THE old days in Oklahoma are gone. The written record over the last 5 years, in terms of major discoveries, shows that deeper and much more costly wells are the trend.

Costs involved in this future era, however, will not be the single new factor. What already has been found for some of these newly discovered reserves is even more radically different from the older pools, and what will be required for proper development will be just as radical.

Engineering and producing technology likewise is on the threshold of a new era in the development and producing of these deep reservoirs. Practices used at Cushing, Seminole, Oklahoma City, and even currently at West Edmond, will not remotely begin to "fit" if maximum recovery and efficient operation are to be secured. The same trend, moreover, is in evidence in Texas, the Rocky Mountain area, and in California.

Deep Anadarko Basin Pools

Where are the new discoveries and what will the new days in Oklahoma oil be like? Most of the new pools likely will be in western Oklahoma, somewhere in the vast Anadarko Basin, which has for its eastern limits the buried Nemaha Mountain Range that bisects the state from north to south. A half dozen pools at 10,000-11,000 ft. already are "in."

It seems quite clear that the present status is but a starting point, because the discoveries so far have been near the edge of the basin, or in relatively shallow territory. Geologically many of the future structural objectives may be on the order of 20,000 ft. in depth, and as to cost for that kind of completions, it easily may require half to a million dollars per single well. Unitization and cooperation will be not simply desirable, but virtually essential.

North Lindsay Pool Is Example

The recently discovered North Lindsay pool in McClain County is a good example of one kind of reservoir that likely will be found in the future in the deeper formations of western Oklahoma. The producing formation, the Bromide sand (Ordovician), is 11,000 ft. in depth. Character of the reservoir was disclosed recently by the operator, Cities Service Oil Co., before the Oklahoma Corporation Commission in testifying that 80-acre well spacing and substantially complete pressure-maintenance operation are necessary to develop and produce the reservoir.

Two of the outstanding items are the reservoir volume factor and the viscosity of the crude oil. Analyses of bottom-hole samples from North Lindsay show it takes 2.264 bbl. of reservoir crude to get 1 bbl. of stock-tank oil. This shrinkage, 126.4 per cent, is about five times as large as that experienced in most Oklahoma pools of 3,000-5,000 ft. depth, where the shrinkage generally is about 25 per cent. The viscosity of the crude oil at reservoir pressure and temperature is but 0.16 centipoises. This is about three times more "fluid" than the lowest viscosity found heretofore in Oklahoma fields. Water has a viscosity of 1 centipoise at 20° C.

The setting of the production programs for North Lindsay and the other 11,000-ft. and plus pools to come can have a profound influence on preventing these reservoir factors from changing to more unfavorable conditions as oil withdrawals are made. If the crude is permitted to shrink, as it is capable of doing to such high degree, or if the oil is allowed to become more

DEEPER AND MUCH MORE COSTLY WELLS ARE THE TREND FOR MAJOR DISCOVERIES IN OKLAHOMA OVER PAST 5 YEARS. DURING 1944-1945 (EXCEPTING EAST PAULS VALLEY, COST WAS $234,000 PER WELL

	Pool discovered			Producing	Depth	Well	Est. drill. equip., tank
Pool name—	Date	Company and lease	Description	formation	(ft.)	spacing	battery
Cumberland	4-40	Pure, Little	28-5s-7e	Bromide	5,200	40 ac.	$55,000
Cumberland				McLish	5,800	40 ac.	67,000
Cumberland				Oil Creek	6,400	40 ac.	82,000
Apache	7-41	Texas Co., Z. N. Smith	2-5n-12w	Bromide	3,750	40 ac.	75,000
Pauls Valley	4-42	Pure, Teter	31-4n-1e	Bromide	4,000	20 ac.	39,500
West Clement	2-43	Stephens, Pierson	35-6n-10w	Medrano	6,000	40 ac.	70,000
West Edmond	4-43	Gutowsky, Wagoner	32-14w-4w	Hunton	7,000	40 ac.	90,000
Sentinel	9-43	Gulf, Hopkins	8-8n-20w	Penn.	5,600	40 ac.	65,000
West Moore	11-43	Mid-Continent, Harris	29-10n-3w	Bromide	8,800	40 ac.	125,000
E. Pauls Valley	2-44	Ramsey, McDowell	13-3n-1e	Penn.	2,950	20 ac.	36,000
Washington	4-44	Carter, Cottingham	4-7n-3w	Bromide	10,650	2 wells	349,000
South Moore	6-44	Mid-Continent, Westheimer	26-10-3w	Bromide	8,800	40 ac.	125,000
West Noble	10-44	Carter, Johnson	30-8n-2w	Bromide	8,200	1 well	208,000
South Moore	12-44	Mid-Continent, Brand	26-10n-3w	Penn.	7,900	40 ac.	110,000
Chitwood	5-45	Magnolia, Cunningham	33-5n-6w	Penn.	10,900	1 well	250,000
North Lindsay	8-45	Cities Service, Lawson	22-5n-4w	Bromide	10,995	1 well	328,000
Blue Knoll	11-45	Carter, Mottinger	5-8n-3w	Bromide	10,844	1 well	271,000

viscous, the ultimate recovery will be lessened in these kinds of pools, not to a small degree, but several-fold.

The endangerment of the recovery is not from guesswork or mere speculation, either. At this time, research and engineering of petroleum reservoirs have come far enough along, as will be noted in this article, that practically every single point and factor in a pool can be evaluated in terms of recovery, and for those things that can be controlled by development and production practice, the barrels per acre and dollar gains by doing so can be computed. Some of the pools will be of the internal gas-expansion type. Return of gas to the formation can improve recovery substantially, in calculable amounts. Effect of oil viscosity, gas solubility and shrinkage, bottom-hole pressure and other factors likewise can be evaluated and the effects can be shown to range several-fold in recovery from the "poor" side to the "good" side.

The present threshold position at North Lindsay probably emphasizes, to a degree greater than has yet been experienced in the industry, the need for unitization, wider well spacing, and formulation of comprehensive production plans that are in accord with sound reservoir principles and specific data. Engineers cognizant of the conditions and working with the data obtained feel that if the Lindsay development should be carried through with nothing more done than the mere routine of completing wells on close spacing, such as one well to 20 or 40 acres, the field may turn out badly on all counts.

Pools Can Be "Gutted" by Undue Pressure Dissipation

There already is one 7,000-ft. Wilcox sand pool that stands as a dismal example of the old "do nothing but drill them thick and quick, and produce" manner of exploitation. In that field, first a large part of the original gas cap was blown off because it was not known that oil was present around the sides; then, when the surrounding oil section was discovered, a furious drilling campaign was started for the oil, drilling to the thin, low-porosity pay at 7,000 ft. on 10-acre spacing. To make a long story short, and to forego discussion of amount of underground waste that occurred, it is sufficient to note that not more than about one-third of the so-called "10-acre locations" had been drilled up before it was discovered that the whole pool had reached, "pressure wise," a state of depletion. And "pressure wise" also was found to be "production wise," and plugging started. The time was a number of years ago, it should be stated, and before testing procedures, engineering, and mechanics of reservoirs had had any substantial advance.

Washington Pool

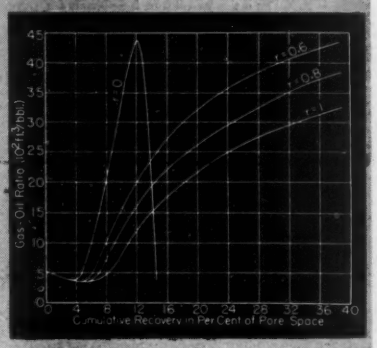
The Washington pool also is in the 11,000-ft. depth category, which is more than one-half again as deep as the West Edmond pool and Oklahoma's largest oil activity in several years. The dissolved gas and shrinkage of reservoir oil are not as large as at North Lindsay; in fact, the oil is greatly undersaturated, the "bubble point" being 3,000 psi. The undersaturated character of the crude will cause a relatively rapid rate of pressure decline in the first stages of production and it also will cut short flowing life of wells with low productivity indices.

No effort nor expense was spared to obtain all information possible from the Washington wells which have been drilled so far, and the data show that if a development and producing program were to be set on the old concept of close well spacing and costly pumping practices, the pool definitely would be submarginal and the expenditures far more than the returns obtainable. In short, in the "old days" it could not be completely developed. What is present at Washington shows that it is only in the light and use of modern fluid-flow knowledge and correct well-spacing principles, that the pool can be developed at all.

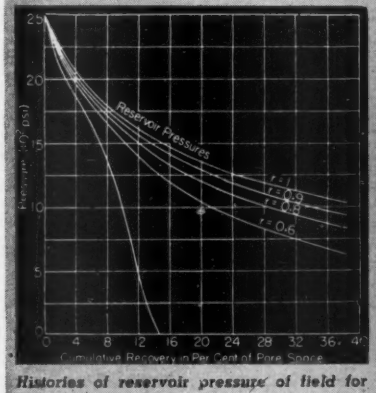
The one productive formation is the second Wilcox sand. The first Wilcox is not developed in the area, since the field appears to lie in the transition zone between the northern and southern sections of the Oklahoma geologic column. The second Wilcox at Washington is composed of permeable sand sections with intermingled and interbedded tight dolomitic sand and siliceous dolomite. The dolomite cementing material, fine sand, and silt are interspersed between the coarser sand grains and result in the average porosity being only 12 per cent and the permeability 135 md. The con-

Modern petroleum engineering has advanced to such degree that, with adequate basic reservoir data, virtually all pertinent factors concerning future performance of pools can be predicted. As an example, Muskat has considered a pool with 40 ft. of sand, 25 per cent porosity, 30 per cent connate water, 2,500 psi. bottom-hole pressure, specific crude oil and gas factors, no water drive, and from these calculated the complete production histories, where there is no gas-cap segregation, for: (1) Ordinary internal depletion, and (2) various degrees of gas injection operation. For (1), the ultimate recovery reaches only 14.5 per cent of the pore space; for (2), if 80 per cent of the produced gas is returned to the formation, the increase in oil recovery is 48.8 per cent.

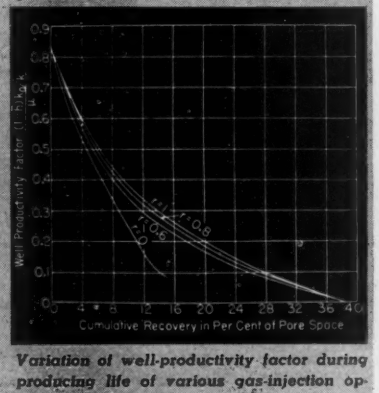
Muskat's curves for the same pool, but where there is complete gravity segregation and gas is returned to a gas-cap phase, are shown below ($r_{o,\ o-g,\ o-g,\ 1}$ = produced gas return of 0, 60, 80, and 100 per cent, respectively):



Gas-oil-ratio trends for various degrees of gas injection



Histories of reservoir pressure of field for various degrees of gas injection



Variation of well-productivity factor during producing life of various gas-injection operations

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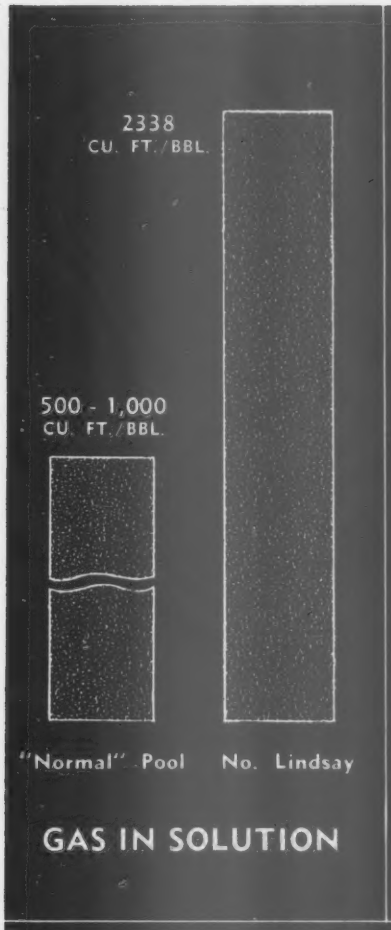
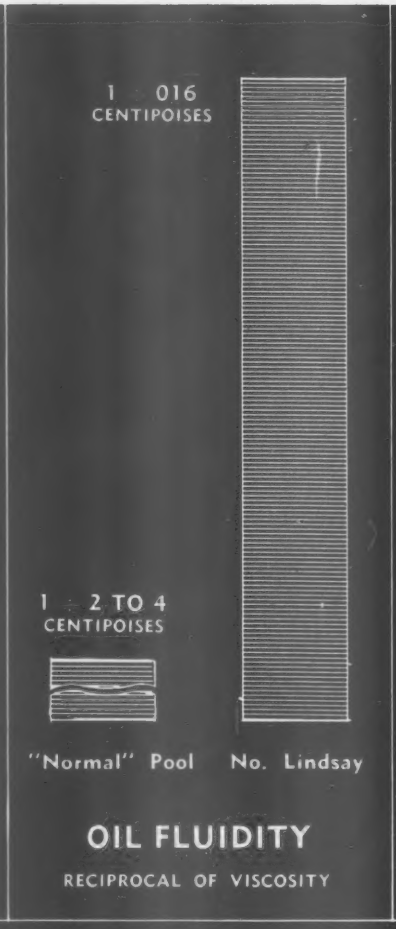




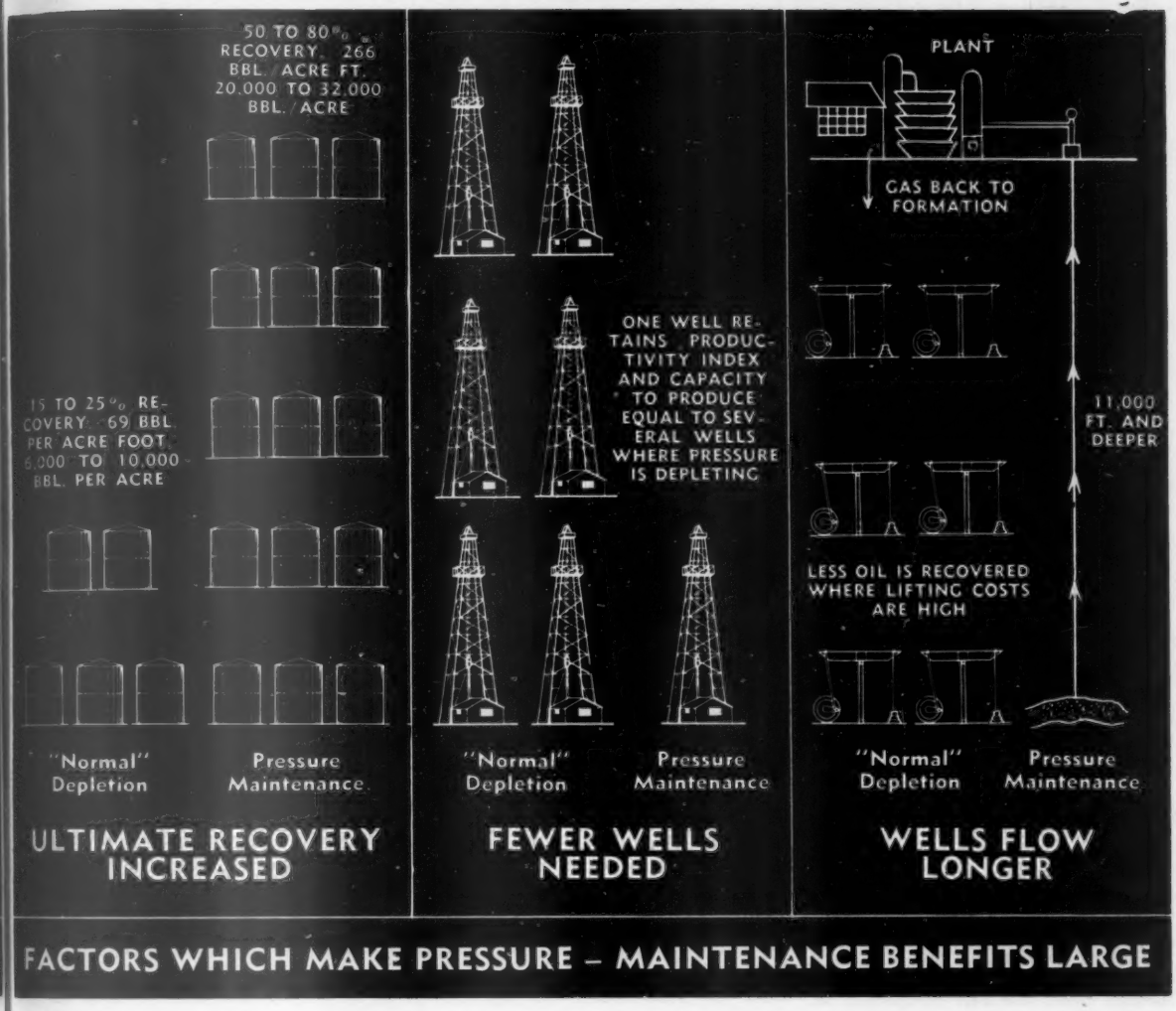
UNUSUAL RESERVOIR CHARACTERISTICS AT NORTH LINDSAY ARE

POOL AND RESERVOIR DATA FOR OKLAHOMA'S TWO NEW 11,000-FT. POOLS

Item or factor—	North Lindsay	Washington
Producing wells	1	3
Location	Sec. 22-5n-4w	Sec. 4 & 9-7n-3w
Present operators	Cities Service	Carter Oil
Dry holes	0	1
Producing sand	Bromide	2nd Wilcox
Producing interval	10,791-10,998	10,587-10,650
Structure	Anticlinal	Anticlinal
Productive acres, probable	3,500	Small
Closure, ft. (approx.)	300	100
Net "pay" sand	92 ft.	39 ft., max.
Permeability, md. (wght'd.)	800	135
Porosity, per cent (wght'd.)	14.4	12
Connate water, per cent	16	35
Bottom-hole press., orig. (psi.)	4,617	4,580
Bottom-hole temperature (°F.)	189	176
Reservoir crude, saturated at	4,576 psi.	3,000 psi.
Solution gas, cu. ft. per bbl.	2,338	1,022
Reservoir volume factor	2.264	1.547
Viscosity of crude, centipoises	0.16 at 4,576 lb.	0.625 at 4,580 lb.
Viscosity of crude, centipoises	1.12 at 0 lb.	1.61 at 15 lb.
Gravity stock tank oil (60/60°)	45.8	40.0
Producing gas-oil ratio	1,936	900

nate water is approximately 35 per cent. Draw-down tests of the producing wells show the effective permeability of the reservoir to be but 60 md. Calculations from the pressure history of the field show the effective permeability of the Wilcox "offstructure," or in the surrounding water-bearing region, to be but 20 md. The calculation has been substantiated by observations of the average permeability of 25 md. in the nonproductive offstructure well. 1 Lamar. These facts all indicate that future water-drive action will be of small amount.

The discovery well at Washington cost $349,807.48. While the average thickness of the producing section has been recorded as 39 ft. there is possibility that at least the lower 5 ft. of pay so counted will be water productive. Computations of ultimate recovery from the reservoir data are 4,000 to 4,800 bbl. per acre. No evidence has been found to expect different recovery efficiency as between one well to 80 acres and one well to 160 acres. except on such points as are in-


50 TO 80% RECOVERY. 266 BBL. ACRE FT. 20,000 TO 32,000 BBL. / ACRE
15 TO 25% RECOVERY. 69 BBL PER ACRE FOOT. 6,000 TO 10,000 BBL. PER ACRE
"Normal" Depletion
Pressure Maintenance
ULTIMATE RECOVERY INCREASED
ONE WELL RETAINS PRODUCTIVITY INDEX AND CAPACITY TO PRODUCE EQUAL TO SEVERAL WELLS WHERE PRESSURE IS DEPLETING
"Normal" Depletion
Pressure Maintenance
FEWER WELLS NEEDED
PLANT
GAS BACK TO FORMATION
11,000 FT. AND DEEPER
LESS OIL IS RECOVERED WHERE LIFTING COSTS ARE HIGH
"Normal" Depletion
Pressure Maintenance
WELLS FLOW LONGER

FACTORS WHICH MAKE PRESSURE – MAINTENANCE BENEFITS LARGE

volved in the rate of production or economic limit at which the wells would have to be abandoned because of operating costs, and these are minor. With individual wells costing appreciably more than one-quarter million dollars each, the data show the pool cannot be developed economically at spacings of one well to 80 acres. An application for 160-acre well-spacing order in the pool has been made.

What Has Research and Reservoir Engineering Shown?

As already mentioned, it is indeed fortunate that the research in reservoir mechanics the industry has made in recent years has shown that wells themselves are only outlets or taps, in the sense of communicating with a tank, and have very little bearing on ultimate recovery, as in contrast to the physical location of the wells, where the bearing on recovery, of course, can be most important. The matter of well spacing is at hand both at North Lindsay and Washington, and probably in first place. Its treat-

RESERVOIR CONTENTS OF NORTH LINDSAY AND RECOVERIES BY COMPARISON WITH OKLAHOMA CITY

Reservoir contents and oil left:	Oklahoma City		North Lindsay	
Factor—	Per cent	Bbl./acre ft.	Per cent	Bbl./acre ft.
Pore space	23.3	1,808	14.4	1,117
Connate water	2.6	47	16.0	179
Space filled with oil and gas		1,761		938
Formation volume factor		(0.737)		(0.468)
Oil in reservoir, stock tank basis		1,298		440
Estimated recovery		600		...
Oil left in net formation space	39.6	698		
North Lindsay, oil left in formation (39.6 per cent of 938)			39.6	371

North Lindsay, recovery by pressure maintenance (as above)		Stock-tank oil, bbl./acre ft.	
Reservoir pressure	Shrinkage	To remain	For recovery
4,576 psi.	.468	174	266
4,000	.529	196	244
3,000	.630	234	206
2,000	.713	265	175
1,000	.794	295	145
50	.917	340	100
0	1.000	371	69

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ment is aggravated by the extreme cost of the wells, to say nothing of the reservoir factors that should dictate the mode of operation for obtaining the highest recovery.

Likely the most lucid and explicit presentation of basic well-spacing principles has been given in "Joint Progress Report on Reservoir Efficiency and Well Spacing"[1] where the summarization is made: ". . . . well spacing of itself has little, if any, physical effect on the mechanics of well drainage or possible yields in normal continuous reservoirs, provided only that the rate of flow in the reservoir as a whole is restricted within efficient limits." And " . . . it is of interest to consider the foregoing in contrast with the data gathered by others in various old fields showing that within a given field there was often a distinct difference between the oil recovery from properties with very close spacing and those with wider spacing, a broad picture usually tied in with the old 'Cutler's Rule.' These data were often taken to indicate that within a given continuous reservoir the ultimate oil recovery expectancy varied directly with the number of wells. This supposed relationship between spacing and recovery has now been found to be due solely to normal regional drainage within the reservoir, induced simply by the creation of low-pressure areas under the leases having the most wells; the result was a widespread influx of oil from adjoining portions of the reservoir but without change in recovery from the reservoir as a whole. In principle, this picture is analogous to that of several operators drawing oil from a common storage tank; the one connected to the most drawoff valves could be expected to secure more of the stored oil than the operators draining through fewer valves."

Maintaining Pressure Lessens Decline in Productivity

With the number of wells in a given area of the pool setting the rate of production rather than substantially controlling the ultimate recovery from the area, it is important for everyone concerned with pool development programs, particularly at depths of 2 miles or more, to examine and understand just what "rate" is and its significance over the producing life of the pool. The rate of a well, of course, is most precisely defined as its productivity index, or its capability of producing a certain number of barrels per day per pound drop in reservoir pressure. If total productivity index or "ability to produce" is the basic function of numbers of wells, that is, the achievement of a desired total field productivity, due recognition should be given to the variance of productivity indices as a function of reservoir pressure and oil withdrawals or recovery. Tarner,[2] Babson,[3] van Wingen[4] have done this, and most recently and in direct analytical form, Muskat[5] (see lower graph on page 77).

Pressure Better Than More Wells

If the oil withdrawals result in a decline in reservoir pressure and in decrease in surrounding oil saturation, the productivity indices of the wells also decline. When this happens, thus if originally there were four wells on 40 acres, four wells on 160 acres, or any other density, if productivity indices are permitted to decline rapidly at some later time the "ability to produce" of the four wells may become equivalent to only one of the original wells. Obviously, then, if possible and feasible, the thing to do is not let the reservoir pressure decline, but develop and produce so that fewer wells retain more of their original productivity values. In such manner one well keeps the ability to do the work of several wells that are produced under the other course. Another method of regaining high productivity indices with fewer wells is by the "off-flank" procedure[6] of extraneous water injection.

Muskat's[5] analytical contribution, it is most important to recognize, makes it possible to compute in advance the future histories and performances for specific pool conditions and various operating procedures, and hence greatly facilitates and strengthens the planning of development and producing programs.

Effect of Viscosity and Shrinkage

Mention already has been made that the North Lindsay reservoir crude has a viscosity of only 0.16 cp. It has been known for a comparatively long time that the lower the viscosity the better are conditions for oil recovery, but quantitative data have been scant. Recently Muskat and Taylor[7] have studied and developed analytical determinations on the effect, in the production histories and ultimate recovery, not only for viscosity by itself, but also for each of these other factors: gas solubility and oil shrinkage, size of an initial gas cap, the permeability - saturation characteristics of the producing formation. For the same producing conditions as for the studies illustrated by the graphs on page 77, their results on the effect of viscosity variation are:

ULTIMATE RECOVERY OF STOCK-TANK OIL DEPENDENT ON VISCOSITY

Viscosity at atm. press., centipoises	Stock-tank recovery, per cent pore space	Recovery, per cent of initial oil
0.69	17.32	32.36
1.38	14.48	27.06
2.76	11.86	22.16
5.52	9.65	18.03
11.04	7.79	14.56

For the consideration of gas solubility and oil shrinkage, a summary from Muskat and Taylor's work is:

EFFECT OF OIL SHRINKAGE ON ULTIMATE RECOVERY

	Solubility at 2,500 psi. (cu. ft. per bbl.)	Atm. pressure viscosity, centipoises	Shrinkage from 2,500 psi. (per cent)	Stock-tank recovery, per cent pore space	Recovery, per cent of initial oil
(1)	267	1.38	15.4	17.33	28.57
(2)	534	1.38	30.8	14.48	27.06
(3)	1,068	1.38	61.6	10.44	24.10
(4)	1,068	2.76	61.6	8.41	19.41
(5)	1,068	1.38	30.8	17.16	32.06
(6)	534	1.38	0	26.85	38.36

Rows 1, 2, and 3 in the table illustrate the reduction in recovery as oil shrinkage increases. The trend for gas solubility, the investigators point out, is due to the proportional relationship between solubility and shrinkage. Their Row 4 again shows the effect of viscosity alone, and Rows 5 and 6 of shrinkage alone.

For those who may like to see a comparison of conditions for one of the deep pools, North Lindsay, the table on page 79 is that which appeared in the recent preliminary state hearings on rules and regulations. It considers only the effect of oil shrinkage on recovery, and gives a comparison with Oklahoma City.

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2. J. Tarner, "How Different Size Gas Caps and Pressure-Maintenance Programs Affect Amount of Recoverable Oil," Oil Weekly, June 12, 1944.

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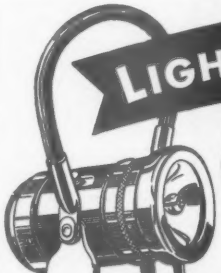

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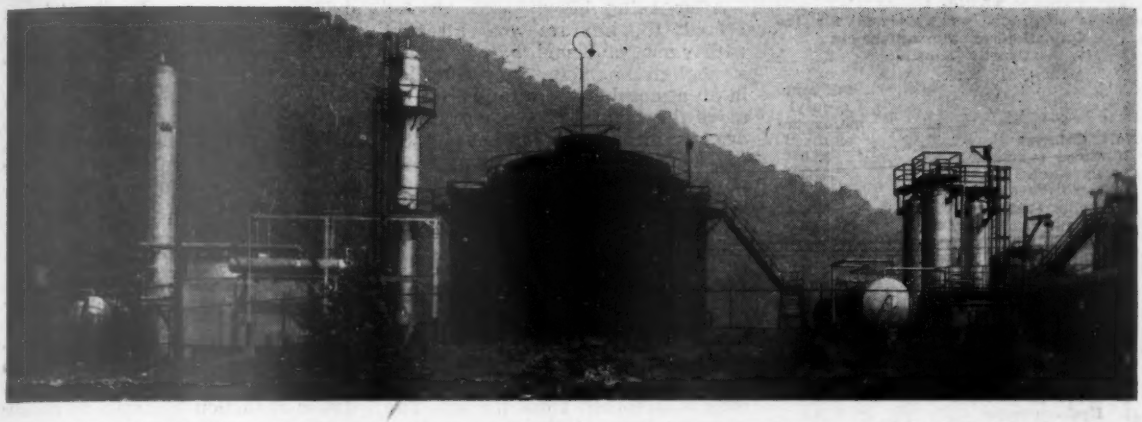


Gasoline flows through mercapsol solution in tower on right, used mercapsol regenerated in tower on left; top horizontal equipment at left is reboiler for supplying additional heat required in regeneration. Coils below are heat exchangers conserving heat by transfer from regenerated mercapsol to used mercapsol. Aluminum-painted equipment on right is final filtering and drying equipment

Regeneration of Caustic Solutions for Gasoline Treating by Catalytic Air Oxidation

by Dr. Donald C. Bond

Use of reagent regeneration by air blowing is preferable when gasoline contains not more than 0.02 per cent mercaptan sulfur. Steam regeneration is more desirable with higher mercaptan concentrations. Air regeneration shows a slight increase in TEL susceptibility of the sweetened product; reagent deactivators are not needed when using this process. Equipment required for this method is simple and practically any sweetening system may be converted to use this process.

Reagents which are suitable for sweetening by oxidation of mercaptans and regeneration by air must be such as to form quinones when oxidized, and the hydroquinones upon reduction.

The author has been with Pure Oil Co. since 1937. He attended Jefferson City Junior College and University of Missouri. The university granted him the Ph.D. degree in 1936. A member of Research and Development Laboratories, he has given his attention to drilling muds, gasoline treating, and the utilization of refinery gases.

MERCAPTANS in petroleum naphthas have been oxidized directly to disulfides by oxidizing agents such as sodium or calcium hypochlorite for many years. The various sweetening methods involving the use of copper salts, which are activated by being blown with air or oxygen, separate from the naphtha, employ ordinary oxidation-reduction reactions. Copper-sweetening methods in which the copper compound and the naphtha are mixed with air or oxygen, without external activation, may be considered as processes involving the catalytic oxidation of mercaptans, though no doubt the same oxidation-reduction reactions take place.

The process of sweetening by bringing the sour naphtha into contact with lead sulfide, in the presence of oxygen,[1] can be assumed to be a catalytic process. Pevere has proposed the sweetening of naphtha by bringing it into contact with a caustic solution containing hydroquinone, which has previously been activated by air blowing.[2] Loyd brings the sour naphtha into contact with oxygen and a caustic solution containing tannic acid.[3]

All of the processes mentioned above convert the mercaptans to disulfides, which remain in the gasoline. It is well known that considerable improvement in lead response can be made by using a treating solution which will remove mercaptan sulfur from the gasoline, rather than convert the mercaptans to disulfides.[4] This is accomplished in a very efficient manner by the conventional Mercapsol process, in which the spent Mercapsol solution is regenerated by steam.[5]

Some time ago The Pure Oil Co. developed a process for the regeneration of Mercapsol and similar caustic treating solutions by air blowing in the presence of an efficient catalyst composed of an inexpensive wood-tar fraction.[6] This process, the first of its kind, enables the refiner to treat gasoline in very simple equipment at low cost, while obtaining an improvement in lead response due to the extraction of mercaptans from the gasoline. Several different Mercapsol solutions have been used with good results. Caustic solutions containing certain types of naphthenic acids and cresols, or high-boiling coal tar acids have proved to be quite effective.

It is the purpose of this article to discuss the regeneration of spent caustic solutions by catalytic air oxidation and to present the advantages and limitations of the Mercapsol-air regeneration method of treating.

Catalysts

A number of substances have been tested as catalysts for the oxidation of mercaptans in caustic solution. The results of some of these tests are given in Table 1.

Method of Testing Catalysts

Take 1.86 cc. of n-butyl mercap-

TABLE 1
Results of Tests on Catalysts for the Oxidation of Mercaptans in Caustic Solution

No.	Catalyst	Per cent n-butyl mercaptan oxidized
1.	Butyl pyrogallol	89.0
2.	Pyrogallol	69.3
3.	n-Butyro-pyrogallol	44.8
4.	Gallic acid	32.5
5.	Tannic acid, C.P.	27.9
5a.	Tannic acid (0.25 per cent)*	7.1
6.	Anthragallol	27.0
7.	3,4-Dihydroxy diphenyl	22.6
8.	2,5-Dihydroxy diphenyl*	22.6
9.	4,4'-Dihydroxy diphenyl*	0.9
9a.	4,4'-Dihydroxy diphenyl (+ cresol to give 10 per cent solution)	1.5
9b.	Cresol (10 per cent)	0.7
10.	Wood tar catalyst	19.8
11.	Hydroquinone	14.6
12.	Quinhydrone*	12.3
13.	Rufigallol	4.0
14.	Quinalizarin*	3.5
15.	Catechol	4.7
16.	Chlorhydroquinone	2.3
17.	1,5-Dihydroxy naphthalene*	2.3
17a.	1,5-Dihydroxy naphthalene (+ cresol to give 10 per cent solution)	25.4
18.	Phenol	0.5
19.	Resorcinol	0.2
20.	o-Chlorphenol	0.5
21.	p-Nitrophenol	2.0
22.	p-Amino phenol	0.5
23.	m-Thiocresol	0.5
24.	Guiacol	0.9
25.	Creosol	0.7
26.	m.p. Cresols (Barrett)	0.4
27.	m-Ethyl phenol	0.7
28.	p-Benzyl phenol	1.8
29.	o-Hydroxy diphenyl	0.7
30.	p-Hydroxy diphenyl	0.5
31.	p-Cyclohexyl phenol*	1.3
32.	1,5-Dihydroxy anthraquinone*	0.9
33.	2,4-Dihydroxy benzoic acid	0.7
34.	2,7-Dihydroxy naphthalene	1.1
35.	2,3-Dihydroxy naphthalene*	0.7
35a.	2,3-Dihydroxy naphthalene (+ cresol to give 10 per cent solution)	0.7
36.	α-Naphthol	1.4
37.	β-Naphthol	2.2
38.	Monobenzyl p-aminophenol	0.8
39.	p-Phenylene diamine*	0.4
40.	p-Phenetidine*	1.5
41.	Alizarin paste (20 per cent)*	0.6
42.	Benzaldehyde	0.8
43.	Cinnamic aldehyde	0.9
44.	Levulinic acid	0.6
45.	Creosote, U.S.P.	0.7
46.	Phloroglucinol	0.5
47.	Orcinol	1.1
48.	Eugenol	1.1
49.	p-Hydroxy phenyl glycine	0.8
50.	None	0.9

*Not completely soluble.

tan dissolved in 50 cc. of 10 per cent aqueous NaOH to give a solution containing 1 per cent mercaptan sulfur. Then 0.554 g. of the catalyst (1 per cent of the NaOH solution, by weight) was dissolved in the solution of NaOH, n-butyl mercaptan. The solution of NaOH, n-butyl mercaptan and catalyst was then transferred to a 100 cc. graduated cylinder containing 75 cc. of No. 4 glass beads. These operations were carried out in the absence of air as much as possible. Through a dip tube reaching to the bottom of the cylinder air was bubbled through the solution for 1 hour at the constant rate of 0.03 cu. ft. per hour, measured at room temperature and pressure.

After being blown with air for 1 hour, the mixture was extracted with v.m.p. and naphtha containing a negligible amount of disulfides, in an atmosphere of nitrogen, to remove the n-butyl disulfide that had been formed. The naphtha containing the n-butyl disulfide was treated with acidic silver nitrate to remove unoxidized n-butyl mercaptan and was then analyzed for disulfides.

Theory of Catalysis of Oxidation of Mercaptans

It appears that the catalysts investigated act in this manner: The catalyst is oxidized to a quinone by oxygen absorbed from the air. The quinone form of the catalyst then oxidizes mercaptan to disulfide; in this step the quinone is reduced to yield the catalyst in its original form.[3]

It is postulated that a polyhydroxy aromatic compound must fulfill the following requirements before it can function as a catalyst for the air oxidation of mercaptans in caustic solution:

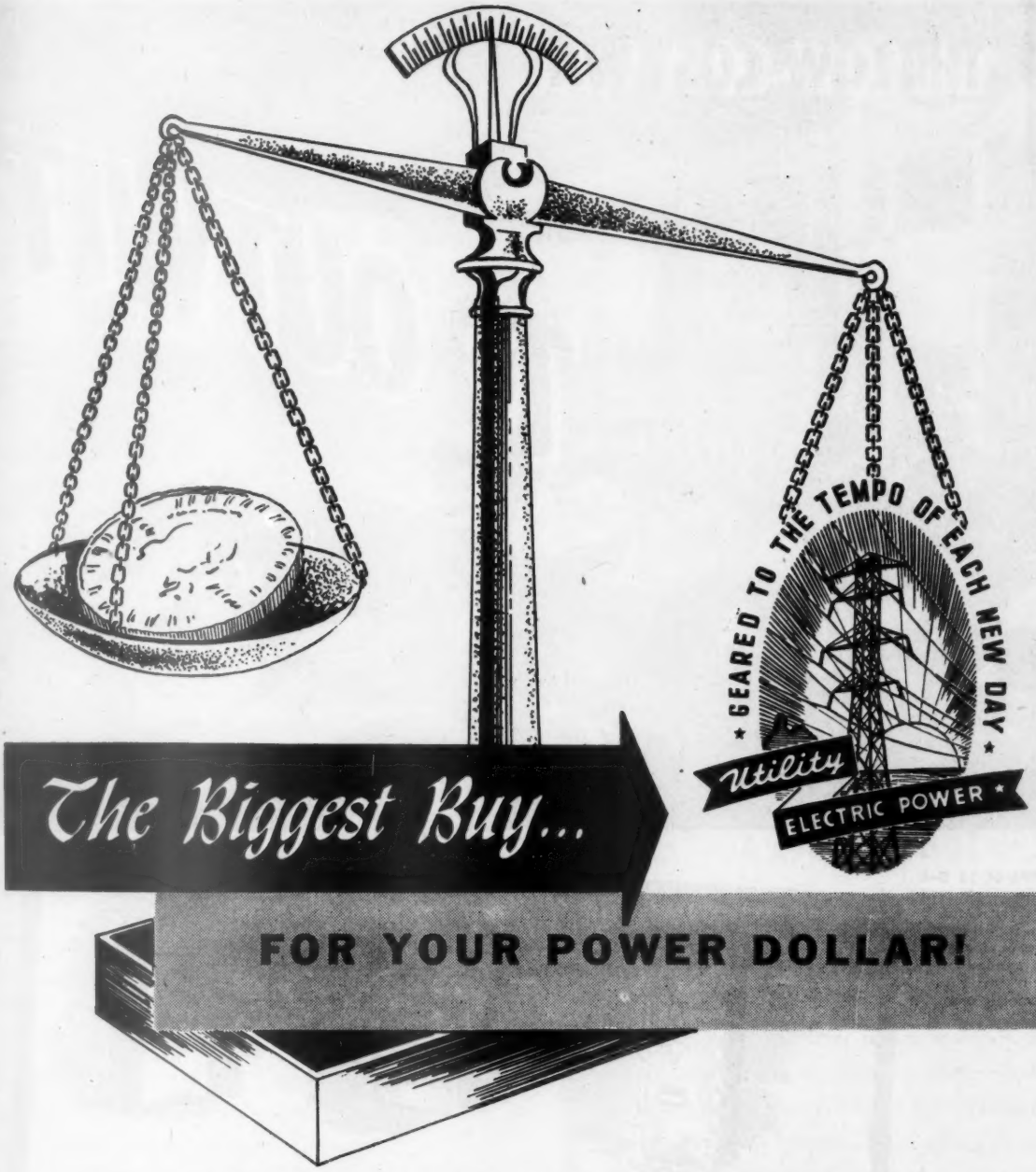
1. The compound should be appreciably soluble in the caustic solution.
2. It should be capable of forming a quinone upon oxidation.
3. The compound and its corresponding quinone should form a system having a low enough oxidation-reduction potential in caustic solution to permit the compound to

TABLE 2—PROPERTIES OF CATALYSTS FOR OXIDATION OF MERCAPTANS IN CAUSTIC SOLUTION

No.	Compound	Solubility in 10% NaOH	Per cent n-butyl mercaptan oxidized in catalyst test*	Critical oxidation potential mv.†	Per cent oxygen absorbed‡	Ratio: per cent mercaptan oxidized, per cent oxygen absorbed
1.	Butyl pyrogallol	>1%	89.0	...	31.4	2.8
2.	Pyrogallol	>1%	69.3	609	37.5	1.9
3.	n-Butyro-pyrogallol	>1%	44.8	<783	21.6	2.1
4.	Gallic acid	>1%	32.5	<780	18.0	1.8
5.	Tannic acid, C.P.	>1%	27.9	<779	16.6	1.7
6.	Anthragallol	>1%	27.0	<780	12.7	2.1
7.	3,4-Dihydroxy diphenyl	>1%	22.6	<790	9.8	2.3
8.	2,5-Dihydroxy diphenyl	>1%	22.6	<783	11.2	2.0
9.	4,4'-Dihydroxy diphenyl	<1%	0.9	882	0.0	(0.9/0)
9a.	4,4'-Dihydroxy diphenyl (+ cresols to give 10 per cent solution)	>1%	1.5	882	0.0	(1.5/0.0)
10.	Hydroquinone	>1%	14.6	647	2.4	6.1
11.	Rufigallol	>1%	4.0	<783	2.6	1.6
12.	Catechol	>1%	4.7	742	3.1	1.5
13.	1,5-Dihydroxy naphthalene (plus cresols to give 10 per cent solution)	>1%	25.4	673	4.1	6.2
14	Phenol	>1%	0.5	1,089	0.0	(0.5/0)
15.	Resorcinol	>1%	0.2	1,043	0.0	(0.2/0)
16.	p-Amino phenol	>1%	0.5	673	2.0	0.3
17.	Orcinol	>1%	1.1	...	0.0	(1.1/0)
18.	α-Naphthol	>1%	1.4	799	0.0	(1.4/0)
19.	β-Naphthol	>1%	2.2	1,017	0.0	(2.2/0)
20.	2,7-Dihydroxy naphthalene	>1%	1.0	1,007	0.0	(1.1/0)
21.	Phloroglucinol	>1%	0.5	799	0.5	(0.5/0.5)
22.	p-Hydroxy phenyl glycine	>1%	0.8	603	2.1	(0.8/2.1)
23.	n-Butyl mercaptan	.....	...	>807	...	...
24.	n-Propyl mercaptan	.....	...	812	...	...
25.	Isopropyl mercaptan	.....	...	819	...	...

*Taken from Table 1. †Limiting values of the potential given for Nos. 3-8, 11, and 23 have not been reported before. The other potentials are taken from Fieser (loc. cit.). ‡Air passed through NaOH-catalyst solution as in catalyst test, but in absence of mercaptan. Per cent oxygen absorbed = $\frac{\text{Amt. of } O_2 \text{ absorbed}}{\text{Total amt. of } O_2 \text{ in air passed through}} \times 100$.

View of one of Pure Oil Co.'s chemical laboratories



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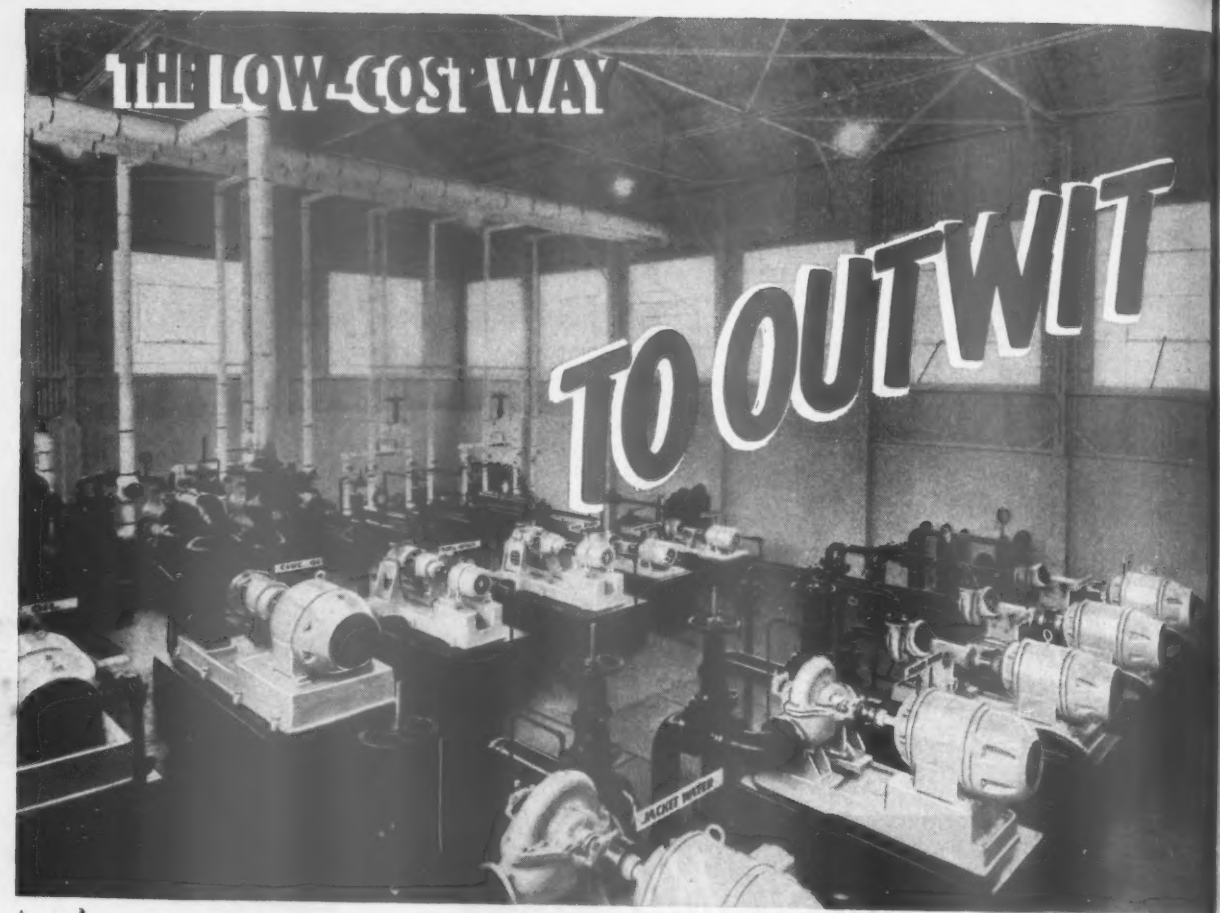

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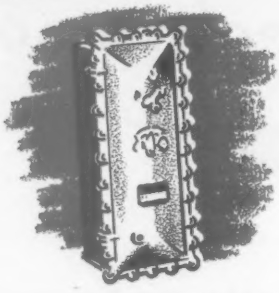

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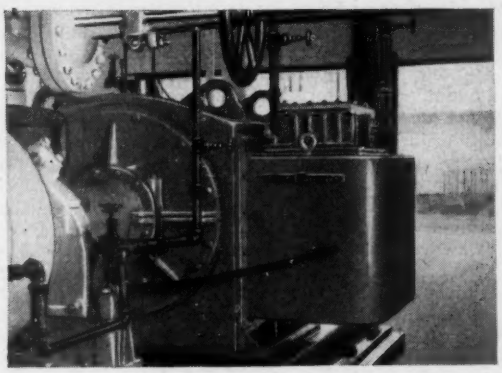

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be oxidized rapidly by oxygen of the air at ordinary temperatures.

4. In caustic solution the oxidation-reduction potential of the quinone-hydroquinone system should be greater than the potential of the mercaptan-disulfide system.

5. It should not contain amino or substituted amino groups

It is to be expected that it will be necessary for the polyhydroxy compound to be soluble in the caustic solution before it can act as a good catalyst. For example, 1,5-dihydroxy naphthalene is not very soluble in straight 10 per cent NaOH solution (No. 17, Table 1), so it has very little catalytic effect. When cresols are added to the solution to increase the solubility of the 1,5-dihydroxy naphthalene (No. 17a, Table 1), the dihydroxy naphthalene serves as an excellent catalyst.

Compounds incapable of forming quinones upon oxidation, such as phenol, resorcinol, and phloroglucinol, do not act as catalysts for the oxidation of mercaptans. Certain ortho and para-dihydroxy aromatic compounds, which do not form quinones on oxidation, are thus excluded. 2,3-Dihydroxy naphthalene is an example of this type of compound, since Fieser[1] has shown that it does not form a quinone when oxidized. Certain compounds that do not contain hydroxyl groups in ortho or para positions to one another are included among the active catalysts, however. For example, Fieser[1] has shown that a quinone is formed when 1,5-dihydroxy naphthalene is oxidized, so this compound can act as a catalyst.

In order to serve as a catalyst for the oxidation of mercaptans, the compound should be easily oxidized in caustic solution by atmospheric oxygen. Inspection of the data given in Table 2 shows that all of the compounds that absorb appreciable amounts of oxygen from air, in caustic solution, possess "critical oxidation potentials," as determined by Fieser, smaller than the critical oxidation potential of the mercaptans.

This means that those polyhydroxy aromatic compounds that are easily oxidized by atmospheric oxygen in caustic solution are the compounds that in neutral solution are more easily oxidized than mercaptans. It appears that this is accidental; there seems to be no fundamental reason why such a relation should exist. (It should be remembered, that according to condition No. 4, the mercaptan should be easier to oxidize than the hydroquinone form of the catalyst in caustic solution.)

Condition No. 3 can be restated thus: In order to act as a catalyst, the compound should have a critical oxidation potential below that of the mercaptan that is to be oxidixed.

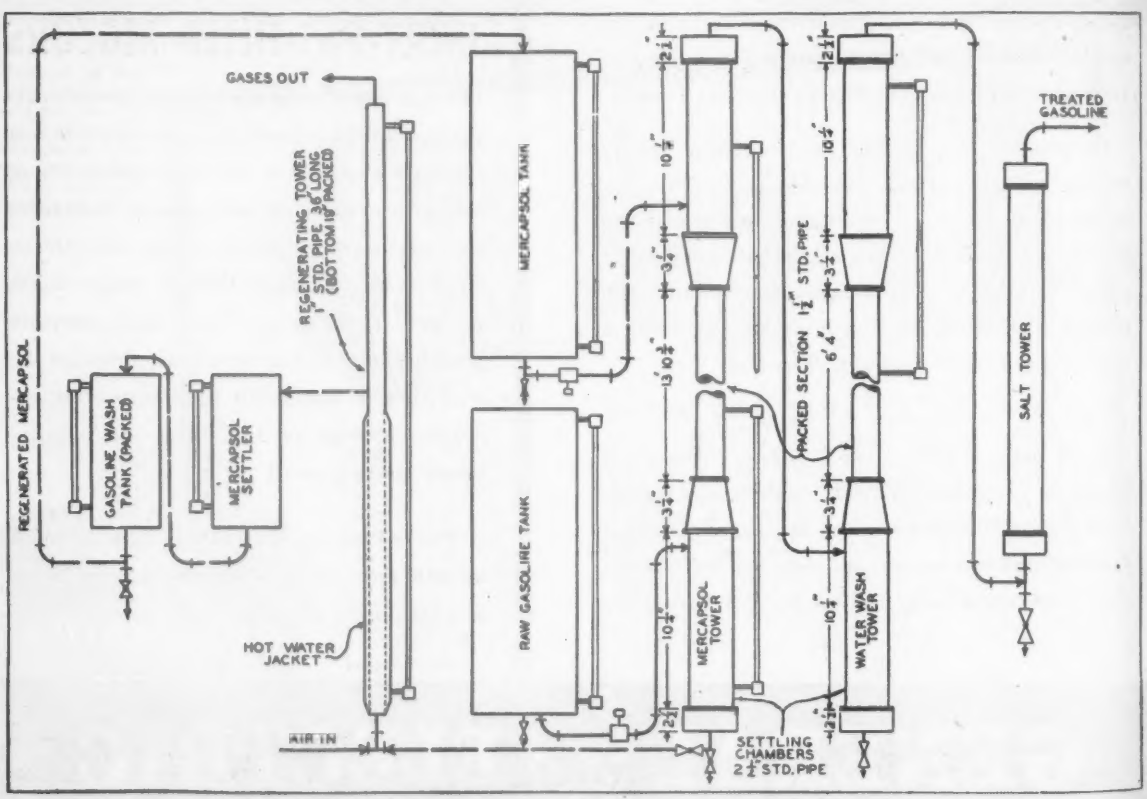
Compounds such as 4,4-dihydroxy diphenyl, having high critical oxidation potentials, therefore cannot act as catalysts.

It is not easy to explain why compounds like p-amino phenol and p-hydroxy phenyl gylcine fail to act as catalysts. They have low critical oxidation potentials and in caustic solution they absorb a small amount of oxygen from the air. Perhaps in caustic solution they act like monohydroxy phenols with little or no formation of quinone on oxidation.

Description of Mercapsol-Wood Tar Air Regeneration Process

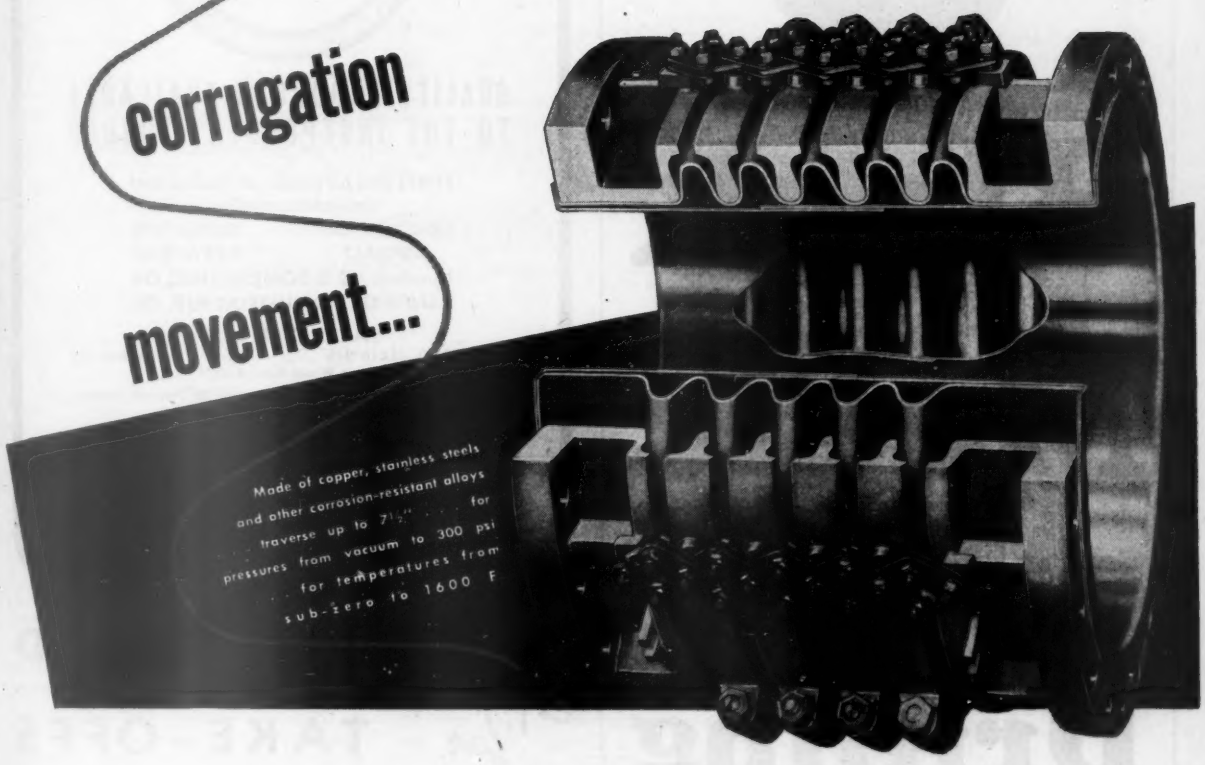
A pilot unit using the air regeneration method is shown diagrammatically in Fig. 1. Raw gasoline is passed through a packed tower countercurrent to a Mercapsol solution containing a small amount of wood tar oxidation catalyst. Gasoline from the treating tower then passes through a water washing tower and a salt drying tower. If the raw gasoline contains much hydrogen sulfide, it is given a caustic wash prior to the Mercapsol treat.

Spent Mercapsol solution from the treating tower is passed into a packed air-blowing tower maintained at 100°-120° F., from which it passes to a settling tank. Here



Flow diagram of mercapsol-air regeneration pilot unit

positively controlled corrugation movement...



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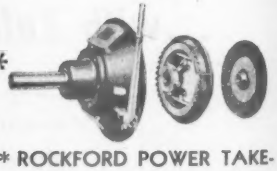

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TABLE 3—TESTS ON GASOLINE TREATED WITH MERCAPSOL REGENERATED BY AIR BLOWING WITH WOOD TAR CATALYST

Gasoline—	Reid vapor press.	A.P.I. gr.	A.S.T.M. distillation I.B.P.	5%	10%	50%	90%	E.p.	Per cent sulfur H_2S	RSH	RS_2	Total
Raw*	8.5	57.4	96	129	146	256	368	413	None	0.022	0.004	0.050
Treated	8.2	57.3	102	134	152	256	364	410	None	0.004	0.010	0.045

Gasoline	Inhibitor susceptibility: Lb. AO-5/1,000 bbl.	Poco induction period, hours
Raw	0	2¾
Raw	3	5¼
Treated	0	2¾
Treated	3	5

Gasoline	A.S.T.M. M.M. octane number 0.0	0.5	1.0	0.2	3.0 cc. TEL/gal.
Raw	66.2	69.9	72.7	76.4	77.8
Treated	66.5	70.0	72.8	76.5	78.0

*Raw gasoline was composed of 60 per cent CHP gasoline from Corning crude plus 40 per cent P.D. from reforming of naphtha from Illinois and Corning crudes.

TABLE 4—COMPARISON OF MERCAPSOL-WOOD TAR AIR REGENERATION TREATING WITH NaOH PREWASH—DOCTOR TREATING

Gasoline — Method of treating

A — Raw CHP, 39 per cent Van, 38 per cent Gulf Coast, 23 per cent East Texas.

B — Prewash with 15° Be. NaOH (45 per cent removal of RSH) followed by doctor treat (plant treated).

C — 10 per cent volume countercurrent Mercapsol treat, air regeneration with wood tar catalyst (pilot plant).

D — Same, 20 per cent by volume treat.

Gasoline	Gr.	Distillation I.B.P.	10	20	30	50	70	90	E.P.	Rec.	Res.	R.V.P.
A	58.3	110	150	178	208	265	310	383	434	98	1	6.8
B	58.3	114	150	176	206	263	310	380	433	98	1	6.7
C	58.0	112	152	180	209	253	307	382	430	98	1	6.4
D	57.7	111	148	175	204	260	308	377	433	98	1	6.4

Gasoline	Per cent RSH sulfur	A.S.T.M. octane number Clear	0.5	1.0	2.0	3.0 cc. TEL/gal.	cc. TEL/gal. for 76 octane
A	0.0135	65.1	69.0	71.7	75.2	77.2	2.40
B	0.0008	64.8	69.3	72.1	74.8	76.8	2.55
C	0.0013	64.5	...	71.7	75.4	77.4	2.20
D	0.0010	64.8	...	71.5	75.3	77.4	2.20

TEL saving—Mercapsol-air regeneration over NaOH—doctor—0.35 cc. TEL/gal.

the small amount of gasoline entrained in the Mercapsol solution separates, washing out a large part of the disulfides formed during regeneration. Then the settled Mercapsol solution passes through a gasoline wash, where disulfides are removed more completely, to yield the completely regenerated Mercapsol solution.

Tables 3 and 4 give the results of tests on representative samples of gasoline treated by means of the Mercapsol method utilizing air regeneration with wood tar catalyst.

Requirements for Treating

Catalyst.—The cost of wood tar catalyst for regeneration of the Mercapsol solution is negligible, amounting to less than 0.05 cent per barrel of treated gasoline.

Air.—About 2 cu. ft. of air is required in treating each barrel of gasoline containing 0.02 per cent mercaptan sulfur. For gasolines containing larger amounts of mercaptans the amount of air is approximately proportional to the concentration of mercaptan in the gasoline.

Steam.—A small amount of steam is necessary for heating the spent Mercapsol solution to 100°-120° F. before regeneration. Exhaust steam may be used for this purpose.

Equipment.—The use of an efficient countercurrent treating tower, in conjunction with a simple air-regeneration system employing wood tar catalyst, will give the best results. However, practically any caustic treating unit can easily be adapted to the use of the air-blowing method. A doctor sweetening unit can be converted to the air-blowing method, with considerable saving in TEL and other chemicals.

TEL.—With low-mercaptan gasolines the amount of improvement in lead response, due to removal of mercaptan sulfur, is small. On the other hand, there is no danger of causing a decrease in lead susceptibility, as there is with doctor treating. If the raw gasoline contains large amounts of mercaptan sulfur (more than about 0.02 per cent), it is preferable to use the steam regeneration Mercapsol method in order to obtain larger savings of TEL, because of the more efficient removal of mercaptans by this process.

Inhibitor.—After the fresh Mercapsol solution has been used for a short time, it becomes saturated with the natural inhibitors in the gasoline. The treated gasoline then has practically the same inhibitor requirement as the raw gasoline (Table 3).

Gasoline loss.—The gasoline lost by vaporization during the air-blowing of the spent Mercapsol solution amounts to about 0.02 per cent of gasoline treated (for raw gasoline containing 0.02 per cent RSH sulfur).

In treating gasoline of low mercaptan content (less than 0.02 per cent RSH sulfur) the air-regeneration method enjoys certain decided advantages over other methods of treating, especially when it is not necessary to lead to a high octane number (above 74 M.M.). In treating gasoline of greater mercaptan content it is generally preferable to use the Mercapsol steam regeneration method.

1. With the air regeneration method it is possible to obtain a small increase in lead susceptibility on treating, while doctor treating generally results in a decrease in lead response and methods involving the use of copper salts do not change the lead susceptibility.

2. Probably the most important advantage of the air-regeneration method is the simplicity of the equipment. Ordinary tanks, pumps, etc., may be utilized, though a countercurrent treating tower is more efficient. It is very easy to convert any caustic treating-steam regeneration system to an air-regeneration system. Since the temperatures involved in air regeneration are low, there is no corrosion problem and no special materials are needed.

3. In comparison with methods using steam regeneration of Mercapsol or other caustic solutions, the air-regeneration method results in the saving of a considerable amount of steam. While the monetary value of this steam may not be so great, the saving of this amount of steam, by air regeneration, may relieve an acute shortage of steam or eliminate the necessity for new steam generation equipment.

4. The lead susceptibility of gasoline treated by the Mercapsol air-regeneration method is at least as great as the susceptibility of gasoline obtained by copper treating. Use of the air-regeneration method eliminates the need for copper "deactivators." Troubles from "carry-over" of clay slurry, changes in moisture content of slurry, and erosion are also avoided.

5. The materials used in the Mercapsol air-regeneration method of treating are inexpensive.

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PRACTICAL PETROLEUM ENGINEERING

Fluid Flow

Graphic Solutions of Design Problems

8—Isothermal Flow of Gases

by Paul Buthod and B. W. Whiteley

During the past few years, the range of operating conditions encountered in gas-transmission lines has changed radically. High-pressure lines operating in the range of 1,000 psi. and sometimes at much higher pressures are common. One might well ask what is the effect of gas compressibility and other factors which are usually disregarded in the design of relatively low-pressure lines.

Semiempirical formulas for computing gas flow have been gradually extended past their valid range and in an attempt to correct for these deficiencies, correction factors obtained by actual experience on similar lines and operating pressures have been applied to the design of new lines. In general, all of these special formulas give accurate results when used within the range of conditions for which they are valid. There is a growing appreciation, however, that accurate design cannot be attained unless all of the factors affecting gas flow are carefully analyzed. The effect of deviation from an ideal gas at high pressures is of more than academic interest and can lead to serious errors if disregarded.

Such an analysis requires somewhat more computation and data than formulas ordinarily used, but this disadvantage is largely overcome if convenient charts are available. By considering all of these factors, the calculated results are equally valid for all ranges of operating pressures, pipe diameters, gas gravities, temperatures, etc.

In considering the flow of gases, the only case of major interest is isothermal flow, such that the gas is substantially at the same temperature along the total length of line. This case includes practically all gas lines and although there is invariably some fluctuation in gas temperature, this variation for actual operating conditions is of negligible importance. The basic equation for gas flow in a pipe is:

$$dy + vdp + \frac{udu}{g} + dh_f = 0 \quad (8\text{-}1)$$

Absolute viscosity and Reynolds number for gases were discussed in Article 7 of this series which was published in the December 1 issue. One chart (Fig. 7-1) is for the determination of Reynolds number for flowing gases, and the second chart (Fig. 7-2) is for determining the absolute viscosity of gas at given conditions of flow. The ranges of both charts cover practical limits pipe size and the other conditions of flow.

For gases and the range of conditions encountered in field transmission lines, both the elevation head and velocity head terms are usually negligible. Consequently for the isothermal flow of gases:

$$vdp = -\frac{fu^2}{2gd}\,dl \quad (8\text{-}2)$$

From the equation of continuity:

$$u = 0.0056\,\frac{QZRT}{D^2P} \quad (8\text{-}3)$$

where Q is expressed in M.c.f./day at 14.7 psi. and 60° F. Substituting (8-3) in (8-2) and expressing the result in common engineering units:

$$Q = 281.7\sqrt{\frac{D^5}{SFTL}\int_{P_2}^{P_1}\frac{PdP}{Z}} \quad (8\text{-}4)$$

In terms of pseudoreduced pressures:

$$\int_{P_2}^{P_1}\frac{PdP}{Z} = P_c^2\int_{P_{r-2}}^{P_{r-1}}\frac{P_r dP_r}{Z} \quad (8\text{-}5)$$

Numerical values of the integral on the left-hand side of Equation 8-5 can be obtained from convenient charts presented by Clinedinst.[1] However, the use of an average value of "Z" between the initial and final pressures involves an error of roughly less than 1 per cent. This error is less than the uncertainty involved in the determination of "Z," hence if an average value is used, Equation 8-4 becomes:

$$Q = 198.8\sqrt{\frac{D^5(P_1^2 - P_2^2)}{SfTZL}} \quad (8\text{-}6)$$

This is the final equation representing the isothermal flow of gases in horizontal pipes. The friction factor "f" is determined from the Reynolds number and relative pipe roughness factor (Articles 2 and 7, this series). The compressibility factor "Z" is an average value between the initial and final pressures and is obtained from a compressibility factor chart (Article 6, this series). If instead of the flow rate the pressure drop or pipe diameter is to be determined, it is necessary to assume an initial average value for "Z" and correct this value on the second trial.

The accompanying charts are based on Equation 8-6 and may be used for the solution of gas flow problems as outlined above. Use of the charts is illustrated by the following example:

Example.—A 10-in. i.d. pipe line is designed to handle 40,000 M.c.f./day of a 0.7° gravity natural gas. The line is 20 miles long, flowing temperature is 80° F. and the initial pressure is 500 psia. Determine the outlet pressure.

Solution.—The compressibility factor for a 0.7° gravity gas at 80° F. and at an assumed average pressure of 350 psia. will be 0.93 (Fig. 6-1). The viscosity factor "μ_p/s" for these conditions is found to be 0.0155 (Fig. 7-2). The Reynolds number is determined as 5,200,900 (Fig. 7-1).

This value of the Reynolds number gives a friction factor of 0.0136 for the 10-in. i.d. pipe (Figs. 2-1 and 2-2).

The value of "$C = 198.8 \div \sqrt{SLTf}$" may now be found, using Fig. 8-1. Enter this chart on the bottom scale at $L = 20 \times 5{,}280 = 105{,}600$ ft. and rise vertically to a temperature line of 80° F. From this point move horizontally to a friction factor line of 0.0136. Thence rise vertically to the specific gravity of 0.7 and moving

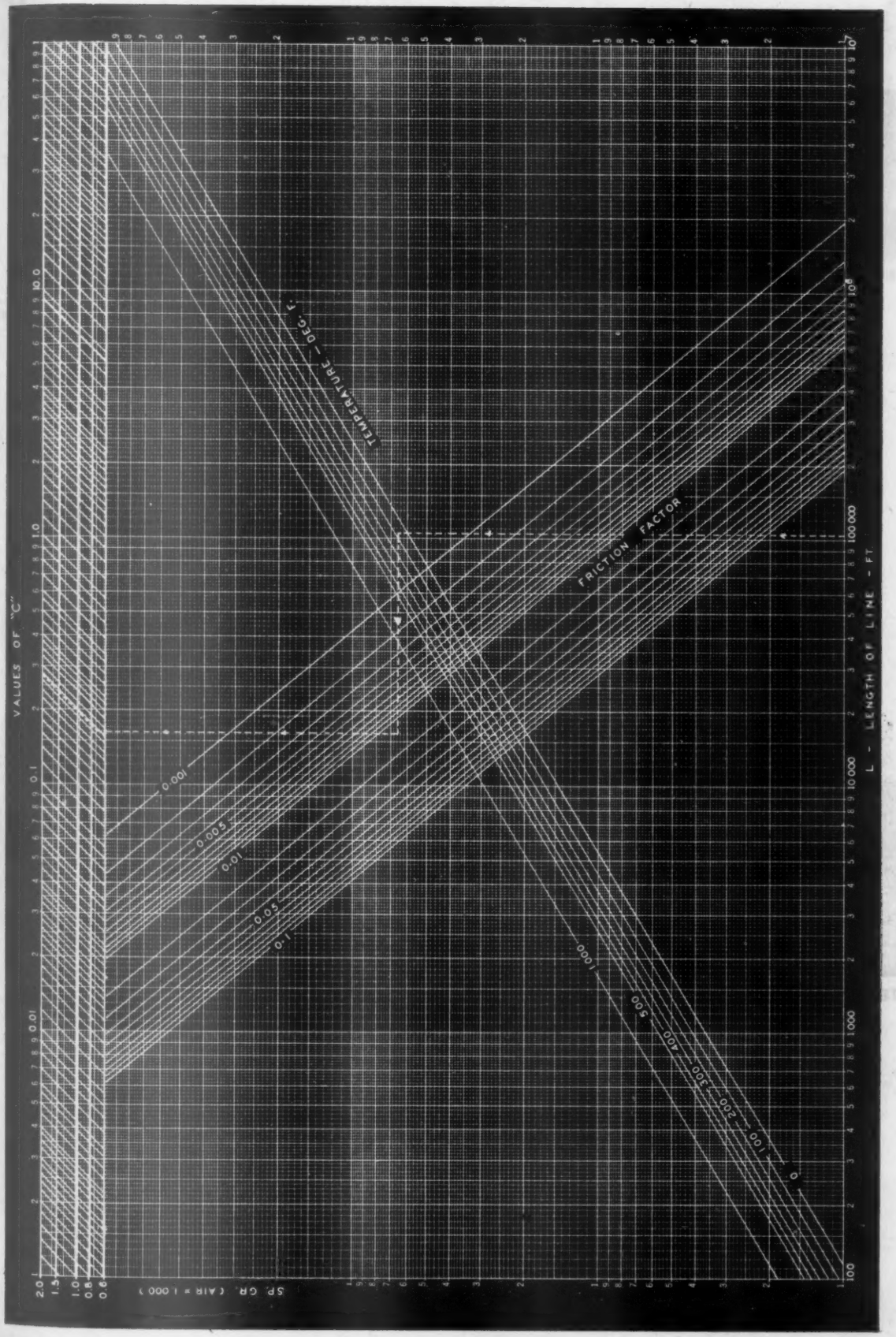
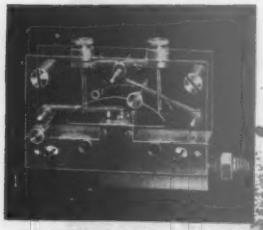
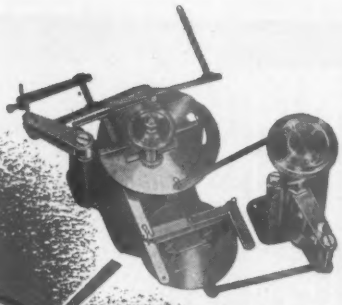

VALUES OF "C"
SP. GR. (AIR = 1.000)
TEMPERATURE - DEG. F.
FRICTION FACTOR
L - LENGTH OF LINE - FT
0.001
0.005
0.01
0.05
0.1
1000
500
400
300
200
100
0

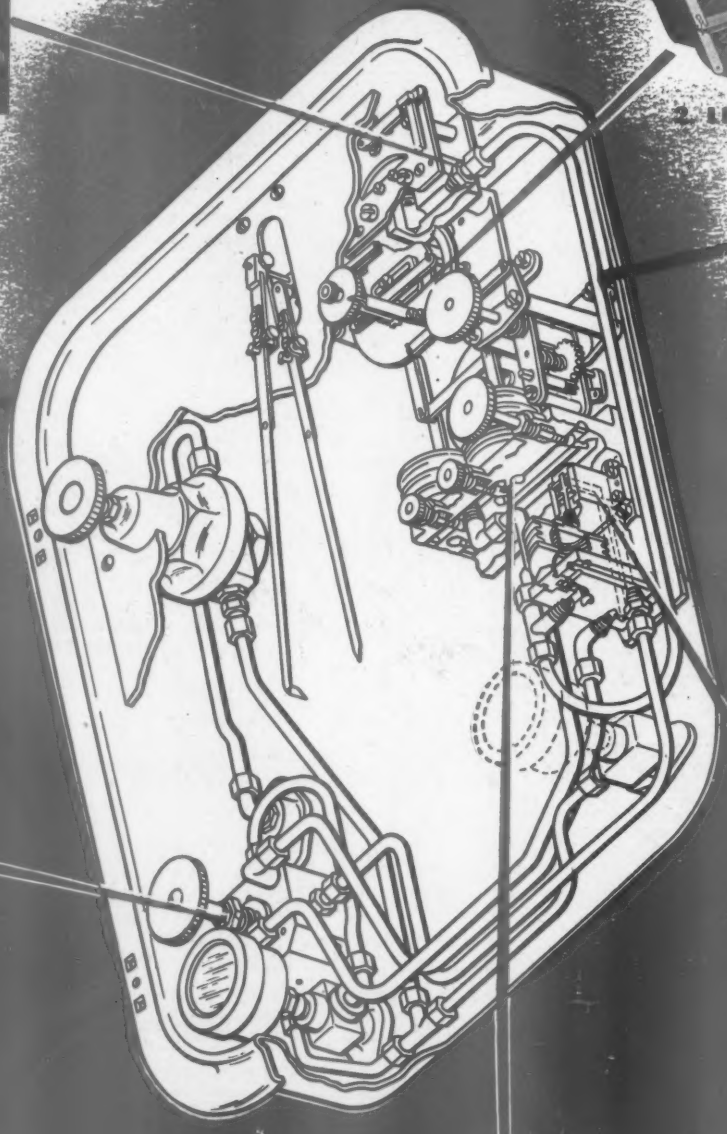
Fig. 8-1

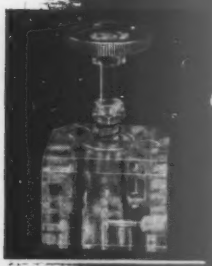


1. CONTROL HEAD



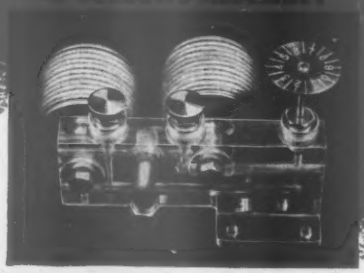
2. LINKAGE SYSTEM





5. TRA

4. BELLOWS ASSEMBLY



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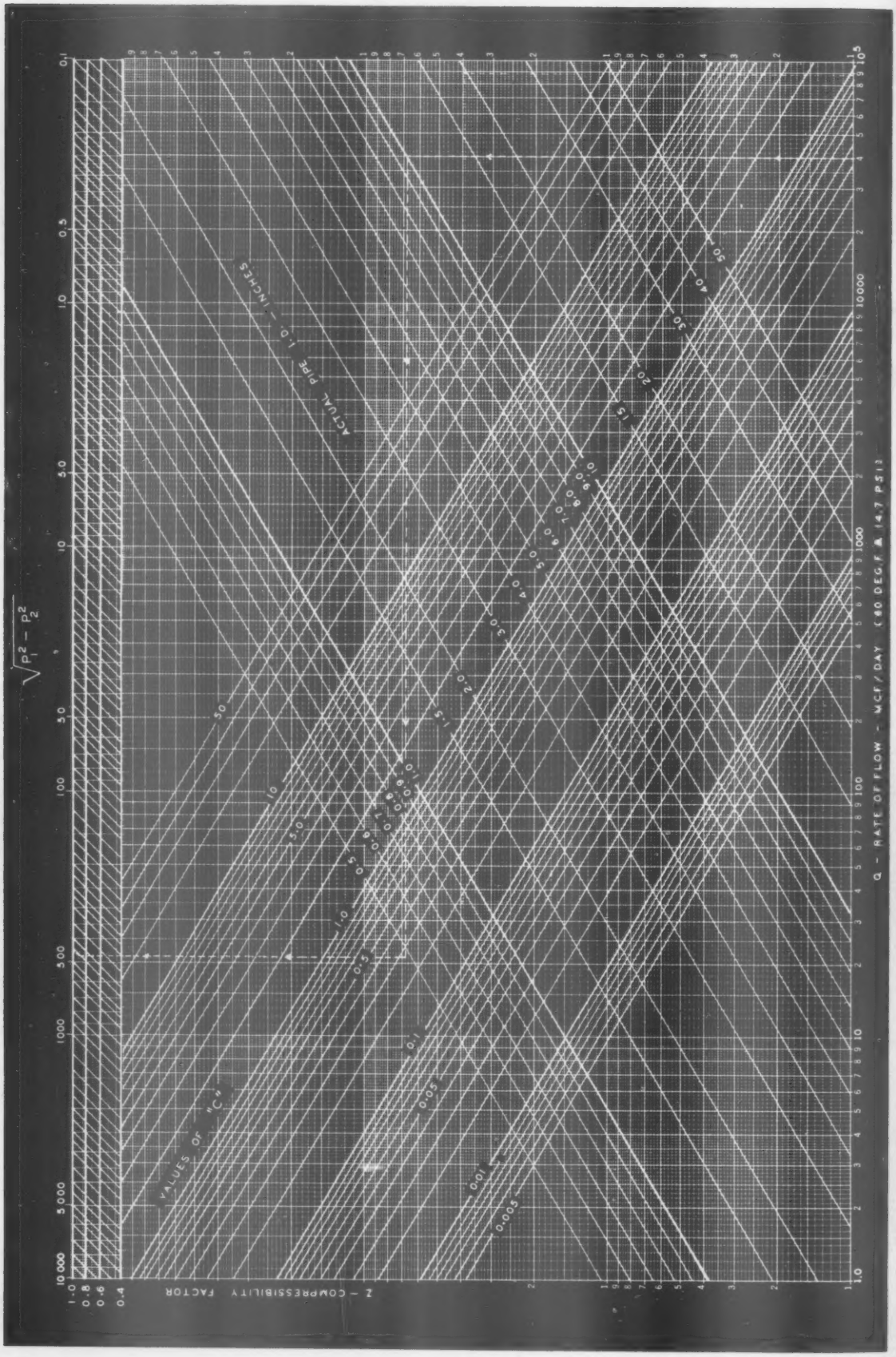
$\sqrt{P_1^2 - P_2^2}$
Z – COMPRESSIBILITY FACTOR
Q – RATE OF FLOW – MCF/DAY (60 DEG.F & 14.7 PSI)
ACTUAL PIPE I.D. – INCHES
VALUES OF "C"

Fig. 8-2

parallel to the diagonal guide lines read a value for "C" of 0.275.

Having obtained "C," the pressure drop may be determined by using Fig. 8-2. Enter this chart on the bottom scale at Q = 40,000 and rise vertically to a pipe diameter line of 10 in. Move horizontally from this point to a "C" line corresponding to 0.275. From this point rise vertically again to a compressibility factor of Z = 0.93. Move parallel to the diagonal guide lines and read $\sqrt{P_1^2 - P_2^2} = 450$.

Then:

$$P_2 = \sqrt{500^2 - 450^2} = 218 \text{ psia.}$$

The average pressure throughout the length of line is 359 psia. which does not change the assumed value for an average compressibility factor of Z = 0.93. Hence the calculated outlet pressure is:

$$P_2 = 218 \text{ psia.}$$

Notation:

- C = equal to $198.8 \div \sqrt{STLf}$
- d = actual pipe i.d., ft.
- d = differential operator
- D = actual pipe i.d., in.
- f = friction factor, dimensionless
- g = acceleration due to gravity = 32.2/sec.^{2}
- h_f = loss in head due to friction, ft.
- l = length, ft.
- L = total length of line, ft.
- p = pressure, lb./sq. ft. absolute
- P = pressure, psia.
- P_c = pseudocritical pressure of gas, psia.
- P_r = reduced pseudocritical pressure of gas, psia.
- Q = flow rate, M.c.f./day (14.7 psi. and 60° F.)
- R = universal gas constant = 10.73
- S = specific gravity of gas (air = 1.00)
- T = flowing temperature of gas, deg. Rankine
- u = linear velocity, ft./sec.
- v = specific volume of gas, cu. ft./lb.
- y = elevation head, ft.
- Z = compressibility factor, dimensionless
- μ_p = gas viscosity at actual pressure, centipoises

Subscripts:

- 1 = conditions at entrance end
- 2 = conditions at outlet end

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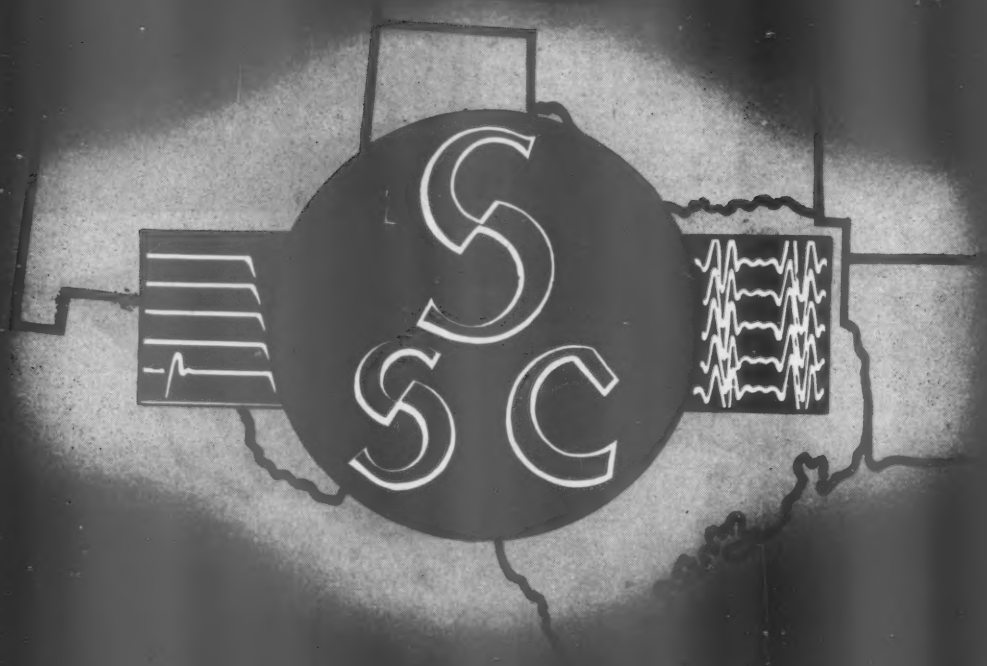

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PROGRESS IN METALS

by W. L. Nelson
Consulting Engineer

Circulating Descaling Acid

A PRIMARY difficulty in descaling the tubes of condensers, exchangers, boilers, or coolers is the introduction and circulation of the muriatic (hydrochloric) acid. The inhibitor used in the acid protects the steel in the lines and tanks because the velocity is low but in centrifugal pumps the high speed of the impeller and surging liquid results in rapid corrosion unless the pump is constructed of special alloys. Somewhat the same is true of reciprocating pumps but because of the scraping action of the piston (or rings) on the cylinder walls.

Difficulty with centrifugal-pump corrosion has been cured for regular circulation conditions by Worthington Pump & Machinery Co., by the use of their alloy Worthite. According to Worthite News of July 1945, this alloy contains over 50 per cent nickel, chromium, and molybdenum, the remaining material being mainly iron. During 10 years of experience with Worthite for valves, pumps, etc., it has been found that little corrosion is suffered with (inhibited) hydrochloric acid strengths of 12-15 per cent at room temperature or 20 per cent acid (inhibited) at temperatures of 70° F. or lower. If proper care is taken, a useful life of 7 or more years may be expected.

An effort has been made to make a truly practical pump by selecting an alloy material that is not brittle so that the pump can be mounted on a portable truck which can be hauled over rough roads or over railroad tracks, a material that can be satisfactorily serviced and repaired by maintenance men who are not familiar with chemical equipment, by evolving a design so simple that any workman who can operate a water pump can also handle the acid pump, and by standardizing on a single line of pumps the parts of which can be held in regular stock.

In handling inhibited muriatic acid, manufacturers of acid recommend:

1. Dilute the acid two to three parts of water to one part of acid in a suitable container such as a wood barrel, tank, or rubber-lined vessel, preferably with a bottom outlet with a rubber acid hose connection to the pump. The volume of diluted acid used is usually an amount equivalent to the volume of the equipment to be cleaned.

2. Connect the pump to the bank of tubes or equipment to be cleaned and circulate the acid, discharging back to the supply tank. Make sure that the equipment is vented to release any gases which may be formed during the descaling operation, and do not add any heat. Continue to circulate for 2 or 3 hours, longer if the scale is very heavy. If the scale of incrustations are particularly heavy, the free acid concentration of the cleaning solution may be so reduced it will no longer dissolve the scale. At this point the cleaning solution being circulated should be discarded and replaced with fresh solution.

3. Discard acid, flush the equipment with fresh water and then circulate an alkaline solution for about 1 hour to neutralize acid and to prevent hydrogen embrittlement. A weak solution of trisodium phosphate or soda ash in water (0.5-1.0 oz. per gallon) is a suitable neutralizer.

Note: If surfaces to be descaled are contaminated with oil or grease, it may be desirable to first circulate a suitable degreasing solution.

Important High-Temperature Materials

ACCORDING to the editors of Metals & Alloys (March 1945) Table 1 is a listing of the high-temperature alloys used in petroleum-refining equipment and parts. Other fields of service are also listed for each alloy. Although the alloys listed are excellent ones, it seems that cheaper alloys and steels such as those cast steels ranging from 13 to 18 chromium, with or without nickel should be given a position of more importance. Such steels do not have the excellent scaling or corrosion resistance of many of the alloys listed but they are used by many refiners and they are usually good for many years of service. Note that more than half of the alloys are good resistors to corrosion by sulfur compounds.

TABLE 1—THE MOST IMPORTANT HIGH-TEMPERATURE MATERIALS

Type, name or designation	Composition (per cent) and structure A = Austenitic or nickel-base F = Ferritic M = Martensitic, hardenable	Usual forms	High-temperature properties: Resists scaling to (°F.)	Resistance to sulfur compounds	Relative creep strength	Resistance to heat shock	Chief fields of use†: Furn. parts and equipment	Petro. refining equip. & heat treat. parts	Steam turbine & power equipment	Others
CM-25*	19-22 Ni, 8-11 Cr, 0.35 C; A	Castings	1,500	poor	good	good	...	some	.....	chemical
HB,* 16 Cr	18-22 Cr, 2 Max. Ni; F	Castings	1,600	good	fair	fair	yes	some	some	.....
HC,* 28 Cr	27-30 Cr, 3 Max. Ni; F	Castings	1,800	good	fair	poor	yes	some	some	.....
HD,* 28-5	27-30 Cr, 3-6 Ni; A-F	Castings	1,900	good	fair	poor	yes	yes	.....	.....
HE,* 29-9	27-30 Cr, 8-11 Ni; A-F	Castings	1,950	good	good	poor	yes	yes	some	.....
HH,* 25-12	23-27 Cr, 10-13 Ni; A	Castings	2,000	good	good	fair	yes	some	some	.....
HK,* 25-20	23-26 Cr, 19-21 Ni; A	Castings	2,050	good	good	fair	yes	yes	some	.....
HL,* 30-20	28-32 Cr, 19-21 Ni; A	Castings	2,100	good	good	fair	yes	yes	.....	.....
HS,* 30-10	29-32 Ni, 8-12 Cr; A	Castings	1,800	poor	good	good	yes	yes	.....	.....
HT,* 35-15	34-37 Ni, 13-17 Cr; A	Castings	1,900	poor	very good	very good	yes	yes	.....	.....
HU,* 38-18	37-40 Ni, 17-21 Cr, A	Castings	1,950+	poor	very good	very good	yes	yes	.....	.....
HW,* 60-12	59-63 Ni, 10-14 Cr; A	Castings	2,000	poor	excellent	excellent	yes	yes	.....	.....
HX,* 66-18	65-68 Ni, 15-19 Cr; A	Castings	2,000+	poor	excellent	excellent	yes	yes	.....	.....
18-8 or 18-9	18-20 Cr, 8-10 Ni; A	Castings	1,500	fair	good	fair	...	some	.....	chemical
Inconel	77 Ni, 14 Cr, 6 Fe, 2 Si; A	Cast and wrought	2,000+	poor	excellent	excellent	yes	yes	.....	.....
Ni-Resist	Cast iron; 14.3 Ni, 4 Cr, 5 Cu; A	Castings	1,500	good	resists growth	.....	some	some	some	chemical
Meehanite HR	Special gray iron, small % Cr	Castings	1,500	good	adequate for light loading up to 1,000°-1,500° F.		some	some	some	chemical; hot dies
Alloy cast irons	Cast iron contg. Ni, Cr, Mo	Castings	1,500	good	adequate for light loading up to 1,000°-1,500° F.		some	some	some	chemical; hot dies
60-15 alloy	60-65 Ni, 14-16 Cr, rest Fe; A	Rod, wire, etc.	2,000	poor	very good	excellent	some	some	.....	resistors to 1,800°F.
35-15 alloy	30-35 Ni, 14-16 Cr, rest Fe; A	Rod, wire, etc.	1,900	poor	good	good	some	some	.....	resistors to 1,400°F
30-5 alloy	30 Ni, 3-8 Cr, rest Fe; A	Rod, wire, etc.	1,800	poor	good	good	some	some	.....	resistors to 1,100°F.
Pure nickel	99+ Ni	Wrought and cast	1,700	very good	poor	good	.....	some	.....	electronic filaments
Carbon-moly steel	0.5 C, 0.5-1 Mo; M	Tubing, rod, strip	1,000	good	fair	.....	.....	to 1,050°F.	to 950°F.	.....
Chrome-moly steel	1.25-3 Cr, 0.5-1 Mo; M	Tubing, rod, strip	1,100	good	fair	.....	.....	to 1,175°F.	to 1,050°F.	.....
4-6 Chrome-moly types‡ 501, 502	4-6 Cr, 0.5 Mo steel; M	Tubing, rod, strip	1,200	good	good	.....	.....	to 1,300°F.	to 1,000°F.	.....
9 per cent chromium	7 Cr, 0.5 Mo, 0.5-1 Si steel; M	Tubing, rod, strip	1,250	good	good	.....	.....	to 1,250°F.	to 1,100°F.	.....
9-10 chromium	9-10 Cr, 0-1.5 Mo; M	Tubing, rod, strip	1,300	good	good	.....	.....	to 1,300°F.	to 1,100°F.	.....
Types‡ 410, 416, 420, 420F	10-14 Cr, sometimes ½ Mo; M	Wrought forms	1,400	good	good	.....	.....	some	.....	.....
Types‡ 430, 440	14-18 Cr, sometimes Si and Mo; F	Wrought forms	1,600	good	fair	.....	some	some	some	.....
18-8; types‡ 301, 302, 303, 304, 321, 347	16-20 Cr, 6-10 Ni, sometimes ½ Mo; A	Wrought forms	1,700	good	good	good	some	some	some	some
Type‡ 316	16 Cr, 10-13 Ni, 2-3 Mo; A	Wrought forms	1,700	good	excellent up to 1,300°F.		.....	yes	yes	.....
25-12; type‡ 309	22-25 Cr, 12-15 Ni; A	Wrought forms	2,000	good	good to 1,600	fair	some	some	some	some
25-20; type‡ 310	24-26 Cr, 19-22 Ni; A	Wrought forms	2,050	good	very good	fair	some	some	some	some

*Alloy Casting Institute designations. †Chief field of use indicated by word "yes" other fields by "some." ‡American Iron & Steel Institute type numbers.

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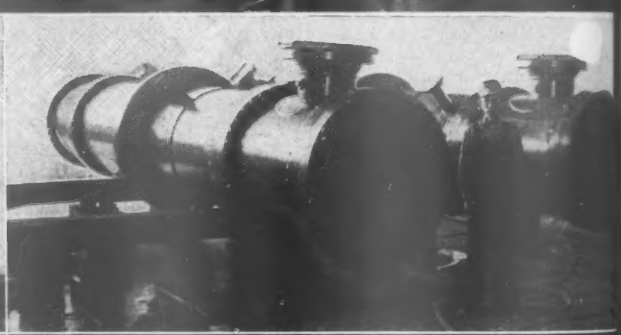

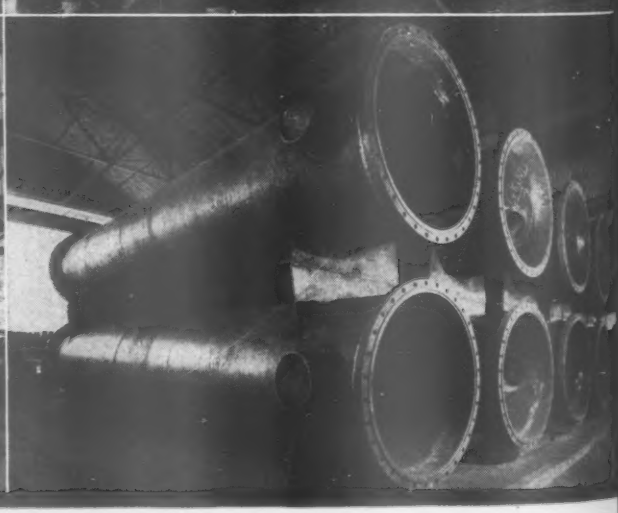

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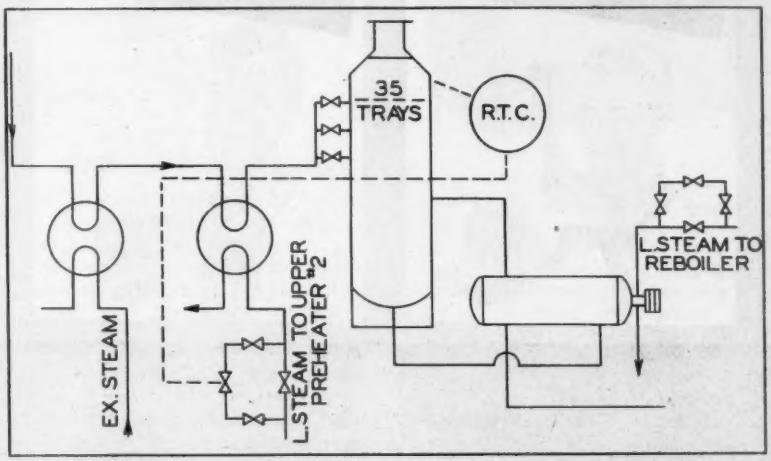
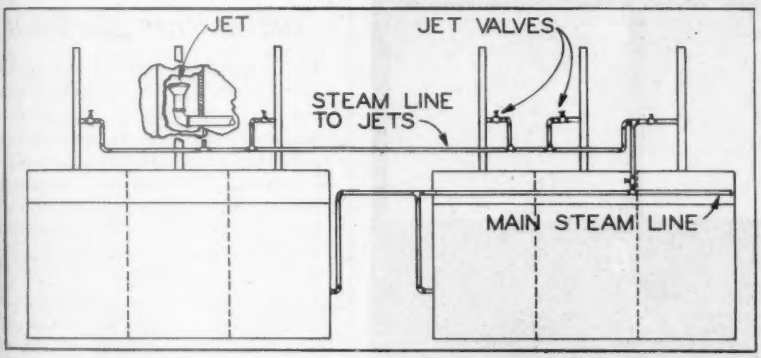
PLANT PRACTICES

Changes in Control Setup Smooths Out Fractionator Operations

TO prevent "spillage" in the fractionator and to smooth out the operation of a light-ends column, the controls were changed as shown in the accompanying drawing. Live steam to the reboiler is now controlled by hand to use, in this case, 21,000-22,000 lb. of steam per hour. The recording temperature controller is arranged to control automatically the live steam to the upper preheater (center of drawing), in order to hold the top temperature to a definite temperature, as 175° F. on the 35th tray of the column. By this simple arrangement it has become practicable to operate a series of towers more smoothly, to prevent "spilling" and to send a more carefully fractionated, more uniform charge stock to the alkylation and copolymer plants. (Idea submitted by L. K. Grimes, shift supervisor.)



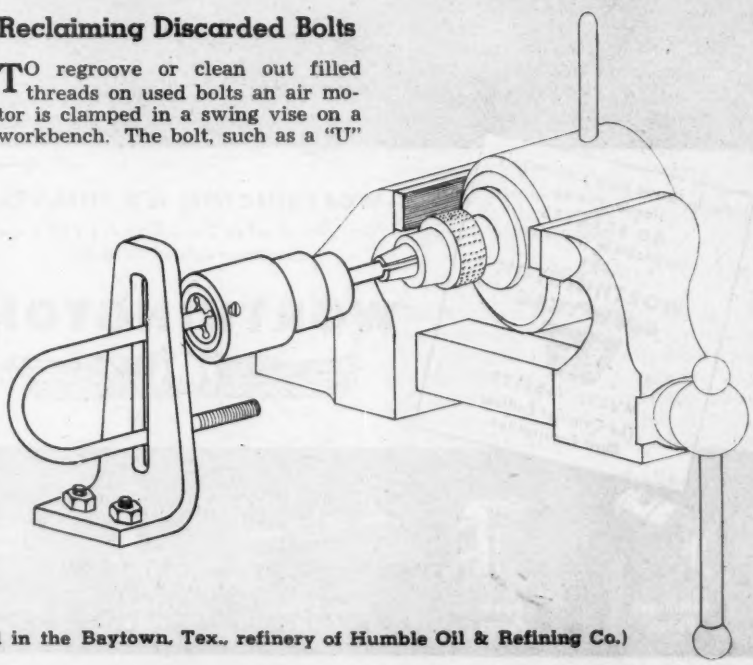


Speeding Up Barrel Cleaning

IN a series of closed-barrel cleaning hoods or rooms, the bottleneck was the removal of the steam after the barrel had been cleaned; it formerly was necessary to open the door and allow natural draft to remove the steam and gases from the room before the cleaned barrel could be removed and a new one placed in the compartment for cleaning. A steam line was installed along the line of ventilator stacks and connected to a steam jet in each stack; with this jet open and operating it is possible to clear the compartment in a fraction of the time formerly required; opening the door speeds the operation. In this particular unit this idea has increased the cleaning schedule by 50 bbl. per day. (Idea submitted by Joe Kulak.)

Reclaiming Discarded Bolts

TO regroove or clean out filled threads on used bolts an air motor is clamped in a swing vise on a workbench. The bolt, such as a "U" bolt, is held in the slotted device shown in the drawing, bolted to the bench. The die is attached to the motor shaft, the motor is swung into position facing the threaded ends of the bolt, and the cleaning out and regrooving is carried out rapidly. This plan has saved several hundred man-hours per month as well as recovered many bolts which would otherwise go as scrap. Whereas four bolts can be reclaimed in 5 minutes by hand, this method recovers 21 bolts in the same time, with a reasonably skilled operator in each case. (Idea submitted by O. E. Repp, boilermaker.)



(The ideas described here are used in the Baytown, Tex., refinery of Humble Oil & Refining Co.)

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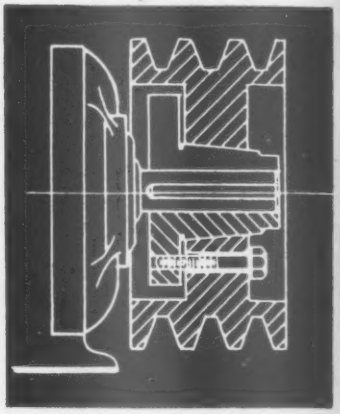

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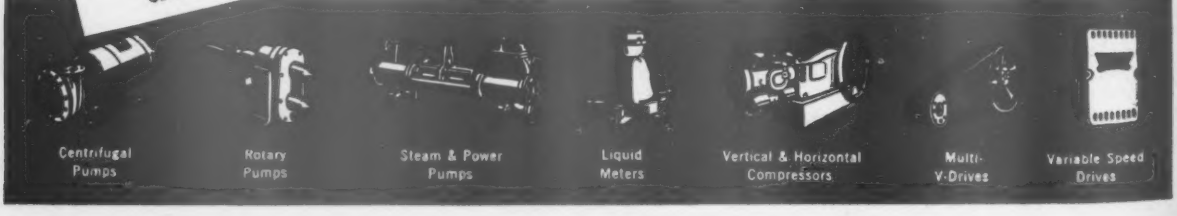
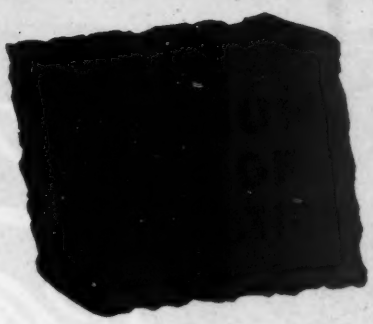


Production Characteristics For Uniform Depletion Rates



*by Park J. Jones**

PART 15 OF A SERIES

DECLINING rates of production may be classified according to rates of depletion. The ratio of producing rate to reserve is the rate of depletion. This ratio, the rate of depletion, may be either uniform or variable. A declining rate of production proportional to reserve is a uniform rate of depletion. A declining rate of production not proportional to reserve is either an increasing, or a decreasing, rate of depletion. This article is limited to uniform rates of depletion. The following characteristics for uniform rates of depletion are illustrated graphically and by examples: (a) Rates of production, (b) cumulative recovery, (c) annual rate of decline, (d) average annual rate of decline, (e) average annual decline, (f) reserve factors, and (g) the number of years required to accumulate a reserve at various rates of depletion. Uniform rates of depletion will be used later to estimate the optimum rate of production for the reserve recoverable at declining rates of production.

Producing Rate vs. Reserve

DENOTE the reserve recoverable at uniform rates of depletion by unity. Let R equal a rate of depletion and C, cumulative recovery. The rate of production Q is then defined by:

$$Q = R(1 - C) \qquad (1)$$

where (1 — C) is the reserve at any time expressed as a fraction of initial reserve. The rate of depletion is in M.c.f.'s per M.c.f., or barrels per barrel, per year of reserve. The rate of production is equal to the rate of depletion times reserve. The initial rate of production, when C = O, is equal to the rate of depletion. At any other time, the rate of production is less than the rate of depletion. The rate of production defined by Equation 1 would be a straight line, if plotted against cumulative recovery. The rate of production at abandonment, the economic limit, is assumed to be negligibly small, less than 1 per cent of the initial producing rate.

Producing Rate and Cumulative Recovery vs. Time

Let n equal time in years. We have seen, in Part 11 of this series, that the rate of production at any time n is defined by:

$$Q = Re^{-Rn} \qquad (2)$$

and the cumulative recovery by:

$$C = 1 - e^{-Rn} \qquad (3)$$

where e is a constant and equal to 2.718 and e^{-Rn} is the reserve at the time n. The curves in Fig. 15-1 are solutions of Equations 2 and 3 for 5, 10 and 15 per cent per year uniform rates of depletion respectively. Cumulative recovery is in per cent of initial reserve. Rate of production is in per cent of the initial rate of production. The latter is numerically equal to the rate of depletion.

Rate of Production Decline

The rate of decrease of the rate of production is equal to the product* of producing rate Q and depletion rate R. The product, QR, divided by the rate of production Q is the rate of production decline. Let D equal the rate of production decline. Then for a uniform rate of depletion:

$$D = R \qquad (4)$$

Accordingly, a uniform rate of production decline is a uniform rate of depletion. The rate of decline defined by Equation 4 is the annual rate of decline on some particular day of a year.

Average Annual Rate of Decline

For some production purposes, the average annual rate of decline is used. The difference between the productions accumulated during two consecutive years divided by the lesser accumulation is equal to the average annual rate of decline. Let D_a equal the average annual rate of decline. In the appendix to this article it is shown that:

$$D_a = e^R - 1 \qquad (5)$$

The upper curve in Fig. 15-2 shows the average annual rate of decline. The straight line is the annual rate of decline on some particular day of the year. We note that the average annual rate of decline is higher than the annual rate of decline.

Average Annual Decline of Production

On some occasions it may be desirable to distinguish between the average annual rate of decline and

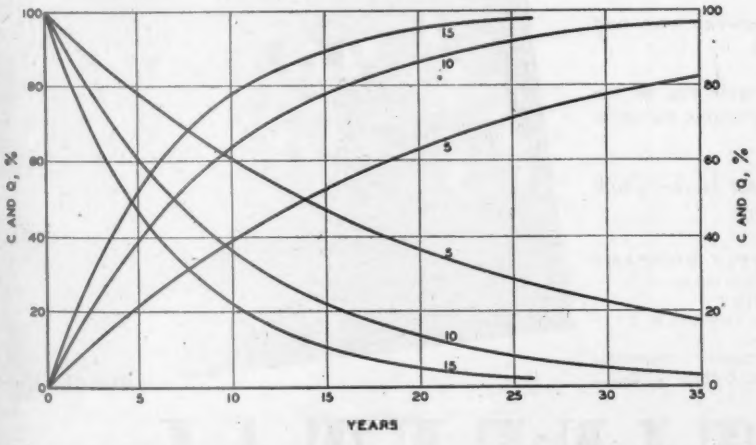


Fig. 15-1—Cumulative recovery and producing rate vs. time for uniform rates of depletion; cumulative recovery in per cent of initial reserve; producing rate in per cent of rate of depletion; rate of depletion at 5, 10, and 15 per cent per year of reserve

*Production consultant, Houston.

*Obtained by differentiating Equation 2.

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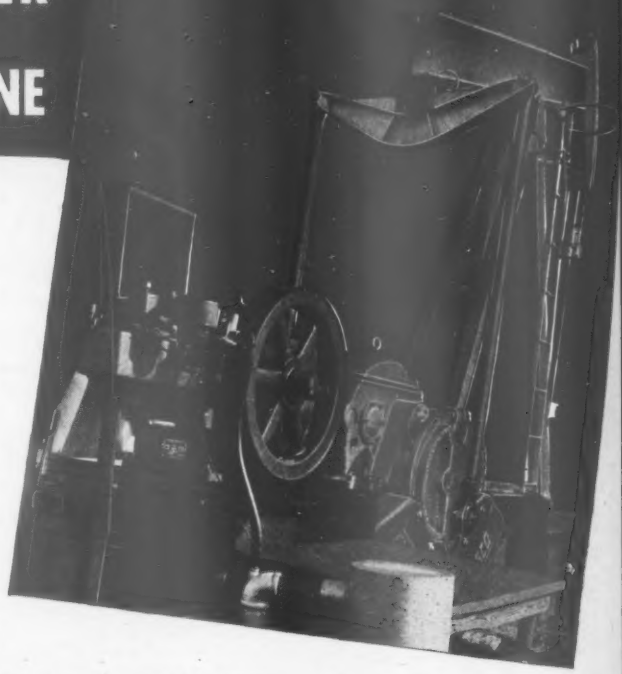

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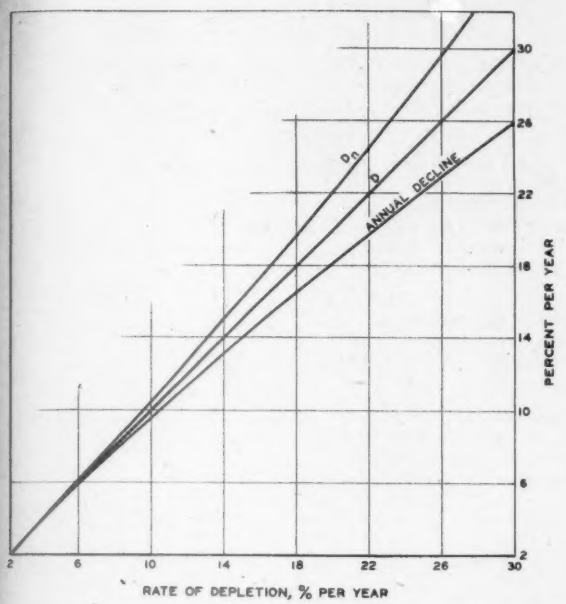
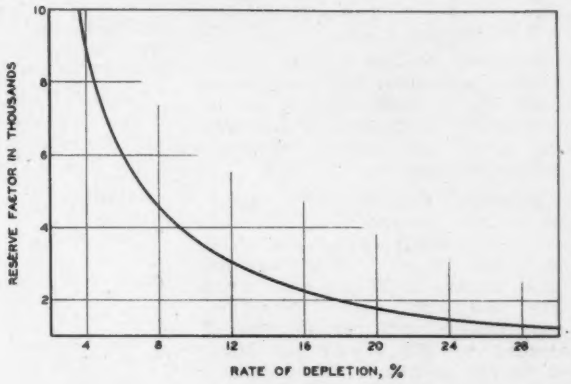


Fig. 15-2—(Left) The rate of decline D, average annual rate of decline D_o and average annual decline for uniform rates of depletion

Fig. 15-3—(Below) Reserve in barrels per barrel, or M.c.f.'s per M.c.f., of declinable daily producing rate vs. uniform rates of depletion



the average annual decline of production. The average annual decline of production is equal to the difference between the productions accumulated during two consecutive years divided by the greater accumulation. In the appendix, it is shown that:

$$\text{Avg. annual decline} = 1 - e^{-x} \quad (6)$$

The lower curve in Fig. 15-2 shows the average annual decline. We might note that the average annual decline of production, for uniform rates of depletion, may be significantly less than the average annual rate of decline. It can be verified from Equations 5 and 6 that:

$$D_o = (\text{Avg. annual decline})\, e^{x} \quad (7)$$

The factor e^x is always greater than one. Accordingly, the average annual rate of decline, for uniform rates of depletion, is always higher than the average annual decline of production.

Example 1.—The productions accumulated from an oil reservoir during two consecutive years are 1,000,000 and 800,000 bbl. respectively. Compare the average annual rate of decline with the average annual decline.

Solution.—In this example, the difference between the consecutive annual accumulations is 200,000 bbl. The annual rate of decline is 200,000/800,000 or 25 per cent. The annual decline 200,000/1,000,000 or 20 per cent.

Reserve Factors for Uniform Rates of Depletion

Let Q denote the rate of production from a reservoir at the time the reserve is (1 — C). Let q be some slower rate of production at some later time when the reserve is smaller and equal to (1 — C — r). Let R equal a uniform rate of depletion. Then, as the rate of production divided by reserve is equal to the rate of depletion, we have:

$$R = \frac{Q}{1-C} = \frac{q}{1-C-r}$$

from which

$$r = \frac{Q-q}{R} \quad (8)$$

Equation 8 states that the reserve r for uniform rates of depletion is equal to the declinable producing rate (Q — q) divided by the rate of depletion. Equation 8 may be written for daily rates of production as follows:

$$\frac{r}{Q-q} = \frac{365}{R} \quad (9)$$

Equation 9 states that the reserve in M.c.f.'s per M.c.f. or barrels per barrel, of declinable daily producing rate is equal to 365 divided by a uniform rate of depletion. This quantity, 365/R, is the reserve factor. The reserve factor times declinable daily rate of production is the reserve. The curve in Fig. 15-3 is a solution of Equation 9. The reserve factor in thousands is plotted against uniform rates of depletion in per cent per year.

Example 2.—The rate of production from a natural-gas reservoir is declining uniformly at the rate of 20 per cent. Estimate the reserve if the current rate of production is 42,000,000 cu. ft. per day. The rate of production at abandonment is 2,000,000 cu. ft. per day.

Solution.—The declinable producing rate is 40,000,000 cu. ft. per day. From Fig. 15-3, the reserve factor is 1,800 M.c.f.'s per M.c.f. of declinable producing rate. Hence, the reserve is 1,800 (40) or 72,000,000,000 cu. ft.

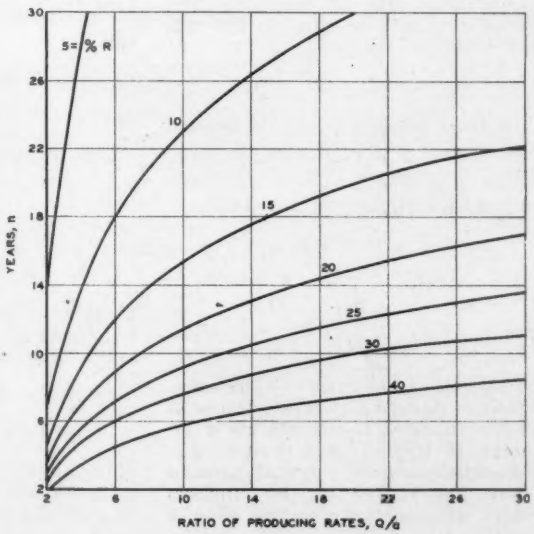


Fig. 15-4—Years required to accumulate a reserve vs. the ratio of initial to final producing rates and rate of depletion R in per cent per year

XUM

Example 3.—The rate of production from an oil reservoir is declining uniformly at the rate of 18 per cent. Estimate the reserve if the current rate of production is 210,000 bbl. per year. The rate of production at abandonment is 10,000 bbl. per year.

Solution.—The declinable producing rate is 200,000 bbl. per year. The estimated reserve is 200,000/0.18 or 1,110,000 bbl.

Example 4.—The average annual rate of production decline is 22 per cent. The average annual production decline is 18 per cent. Estimate the reserve per unit of declinable daily producing rate.

Solution.—From Fig. 15-2, the rate of decline corresponding to a 22 per cent average annual rate of decline and 18 per cent average annual decline is 20 per cent. From Fig. 15-3, the reserve factor corresponding to a 20 per cent rate of decline is 1,800 M.c.f.'s per M.c.f., or barrels per barrel, of declinable daily producing rate.

Example 5.—The productions accumulated during 2 consecutive years are 129,700 and 100,000 bbl. respectively. Estimate the rate of decline.

Solution. —The average annual rate of decline is equal to (129,700 — 100,000)/100,000 or 29.7 per cent. The average annual decline is equal to (129,700 — 100,000)/129,700 or 22.9 per cent. From Fig. 15-2, the rate of decline corresponding to 29.7 and 22.9 is 26 per cent.

Years Required to Accumulate a Reserve

The number of years n required to accumulate a reserve at a uniform rate of depletion, uniform rate of decline, may be obtained as follows: Let the reserve be defined by (Q — q)/R, where (Q — q) is the declinable producing rate and R is a uniform rate of depletion. The producing rate is equal to the rate of depletion, that is:

$$Q = R$$

the final producing rate is defined by:

$$q = Re^{-Rn}$$

Upon dividing Q by q, we obtain:

$$e^{Rn} = Q/q$$

from which

$$n = \frac{2.3}{R} \log \frac{Q}{q} \qquad (10)$$

The curves in Fig. 15-4 are solutions of Equation 10. The number of years required to accumulate a reserve is plotted against the ratio of initial to final rates of production. The curves are for uniform rates of depletion ranging from 5 per cent per year up to 40 per cent per year.

Example 6.—Estimate the number of years required to accumulate the 72,000,000,000-cu. ft. reserve of Example 2.

Solution.—The ratio of the initial to final producing rates is 42/2 or 21. From Fig. 15-4, corresponding to a 20 per cent per year rate of depletion and a producing ratio equal to 21, the life of the reserve is about 15 years.

Example 7.—Estimate the number of years required to accumulate the 1,110,000-bbl. oil reserve of Example 3.

Solution.—The ratio of producing rates is 21. The rate of depletion is 18 per cent per year. By Equation 10, the life n of the reserve is as follows:

$$n = \frac{2.3}{0.18} \log 21 = 16.9 \text{ years}$$

Example 8.—Compare the life of a reserve for 5, 10, and 15 ratios of initial to final producing rates at 10, 20, 30 per cent per year rates of depletion respectively.

Solution from Fig. 15-4.

Ratio of initial to final producing rates	5	10	15
Rate of depletion, per cent per year:	Life of reserve, years		
10	16	23	27
20	8	11.5	13.5
30	5.5	7.6	9.0

References

1. Arps, J. J., A.I.M.E., TP No. 1758.
2. Gross, H. E., The Oil and Gas Journal, Sept. 15, 1938.

Appendix to Article 15

Let ΔC_n equal the cumulative recovery for a given year and ΔC_{n-1}, for the preceding year. Then:

$$D_n = (\Delta C_{n-1} - \Delta C_n)/\Delta C_n \qquad (11)$$

But

$$C_n = 1 - e^{-Rn} \text{ and } C_{n-1} = 1 - e^{-R(n-1)}$$

so

$$\Delta C_n = C_n - C_{n-1} = (e^R - 1)\, e^{-Rn} \qquad (12)$$

Similarly

$$\Delta C_{n-1} = C_{n-1} - C_{n-2}$$

$$= (e^R - 1)\, e^{-R(n-1)} \qquad (13)$$

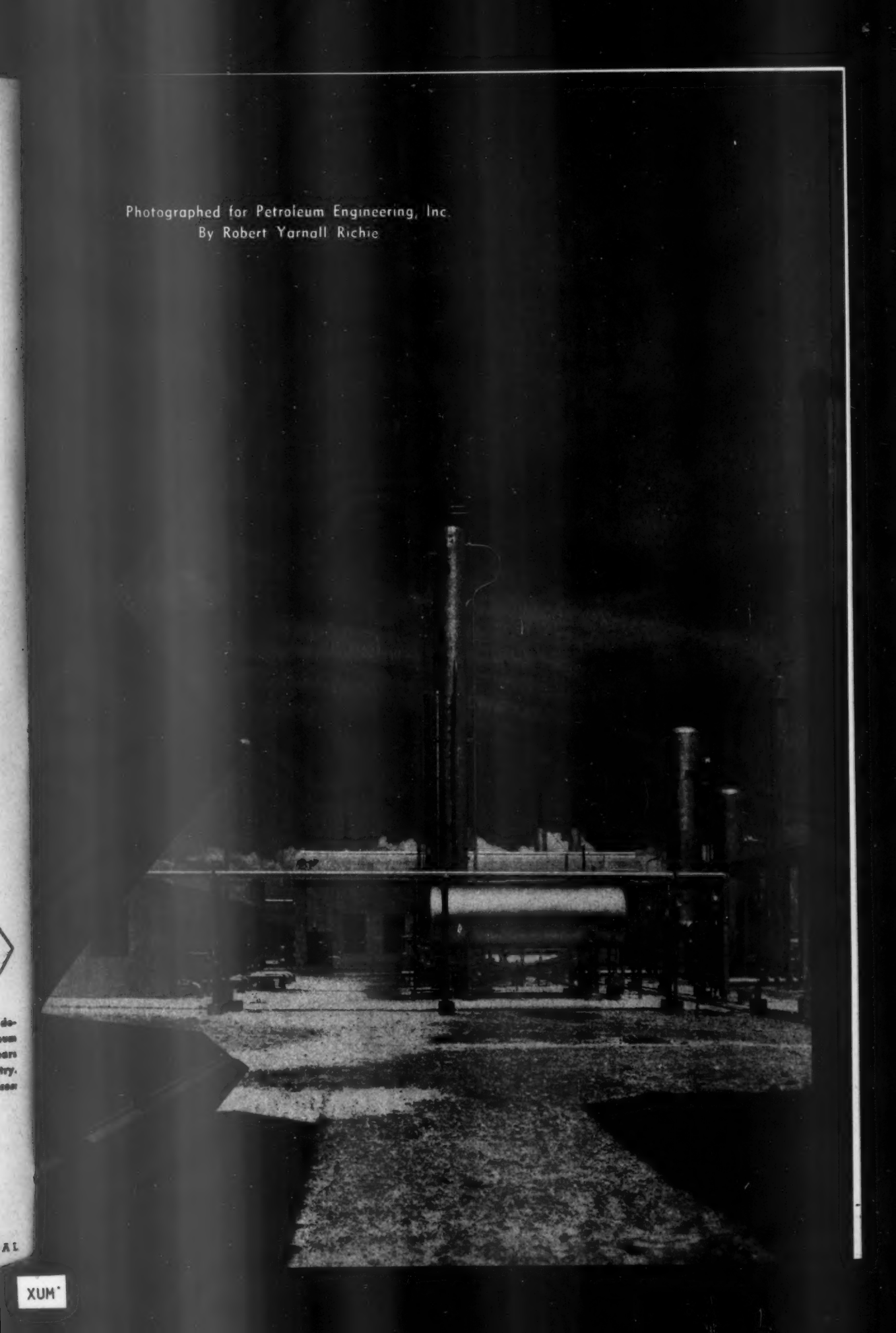
Substitution of the values defined by Equations 12 and 13 in Equation 11 gives Equation 5.

Average annual decline

$$= (\Delta C_{n-1} - \Delta C_n)/\Delta C_{n-1} \qquad (14)$$

Substitutions of the values defined by Equations 12 and 13 in Equation 14 gives Equation 6.

A view of one of many plants designed and constructed by Petroleum Engineering, Inc., in the past 16 years of continuous service to the industry. Petroleum Engineering, Inc., Offices Tulsa and Houston.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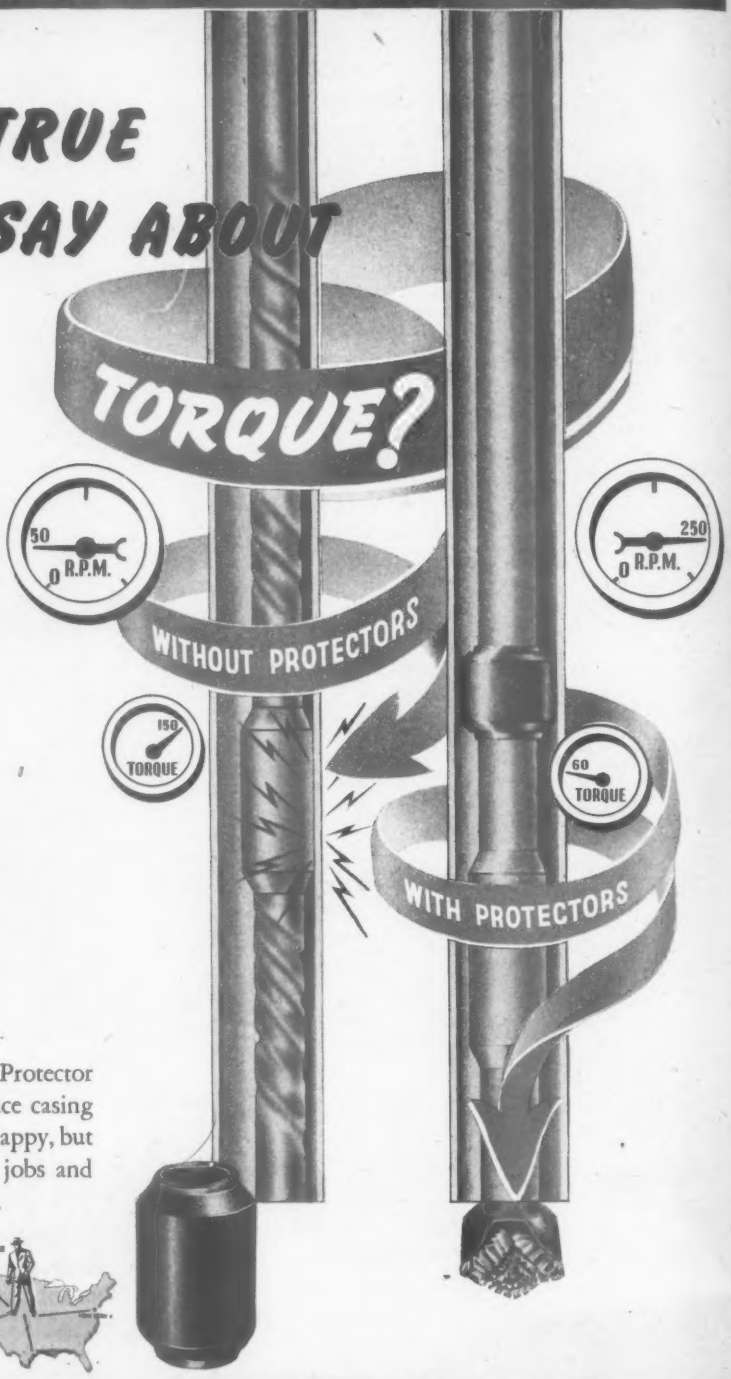

CASE HISTORY No. 2

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A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

How Big an Exchanger?

EXCHANGERS may contain so little surface that they remove scarcely any heat from the hot stock, or they may be so large that they remove all of the heat available in the hot stock. The removal of a large amount of heat is creditable from a thermal efficiency standpoint but it is a highly uneconomical situation because it requires an enormous amount of surface. The most economical amount of surface to use, or the most economical change of temperature to accomplish is defined as the "economical approach" in the tabulations and figures shown on this page. Fig. 1 (a) and (b) illustrates what is meant by the term "approach." In Fig. 1 (a) the hot stock is larger in volume than the cold stock, and the reverse situation is shown in Fig. 1 (b). Thus, the temperature of the small-volume fluid tends to **approach** the temperature of the large-volume fluid. Cases II and III indicated in Fig. 1 are uneconomical either because little heat is transferred (Case II) or because the surface required is too large (Case III), whereas Case I is near the economical amount of heat to save.

Fig. 2 shows economical approaches in terms of years to depreciate the equipment and the ratio of the large volume fluid to the small volume fluid. It applies only to liquid-to-liquid exchangers. For condensers in which complete condensation occurs the R factor (ratio of fluids) may be corrected by the use of one or the other of these two approximate formulas, using whichever one gives an answer that is less than 1.0.

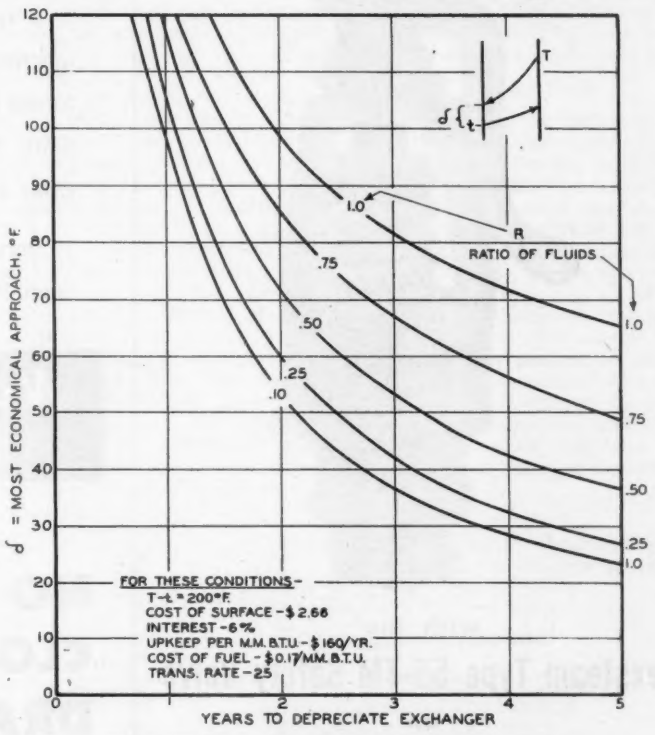

Fig. 2—Most economical approach in liquid-to-liquid heat exchangers, for the average conditions shown

$$R' = \frac{R}{1 + \frac{220}{T - x}}$$

or

$$R' = R\left(1 + \frac{220}{T - x}\right)$$

in which T and x refer to the in and out temperatures of the fluid that condenses and R′ is the corrected R to be used in Fig. 2.

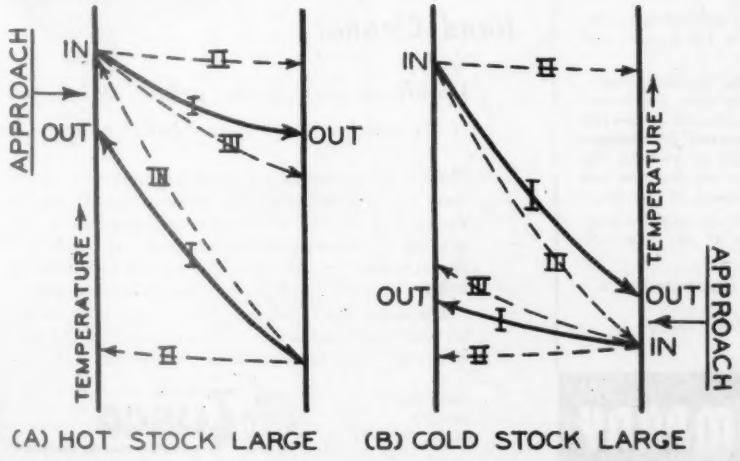

Fig. 1—Approach conditions in counter-current flow exchangers

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A special high quality product, precision-machined from solid bars of alloy steel selected for its high tensile strength and elastic limit. This special alloy was selected only after exhaustive tests of various alloys.

These swaged nipples are made in sizes from ¼-inch to 1½-inch inclusive.

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Engineering Fundamentals

No. 213

A FEATURE OF THE OIL AND GAS JOURNAL

Making Forms for Concrete and Setting Anchor Bolts

CONCRETE in large measure has superseded all other materials in the construction of permanent foundations. Freshly mixed concrete is semifluid and will take the shape of anything into which it is poured. Forms, accordingly, are necessary to hold the concrete to the desired shape until it is set, and they must be well designed and accurately laid out.

Concrete forms usually are built in place, although in some work of a repetitious nature prefabricated shapes and special joining brackets are used. Much time and expense are saved in form work by careful planning and programing before actual work is started. For example, the excavation work has to be completed before carpentry can begin on the form work. The cement, sand and aggregate have to be delivered and laid down in proper quantities and at the most suitable places, mixing equipment set up, etc. It can be advantageous to complete fully the excavation for one part of a foundation in advance of the rest, in order that the building of forms for the first part can be started as soon as possible.

In Fig. 1 is one arrangement of a concrete form, together with an illustration of "wiring," with soft, black, annealed iron wire to prevent buckling. Wood cleats or tie braces also often are used to make the structure rigid against pressures due to the weight of material, and avoid bulging of vertical forms or widening of horizontal forms. Tie rod bolts are another alternative. For form sheeting it is customary to use 1 in. boards, 6 to 8 in. wide as they are both cheaper and have less warping tendency than wider boards. Many ingenious tie-ins and auxiliary construction are possible in good form work, such as the simple runway in Fig. 1.

Lumber for the forms should be surfaced on the side placed toward the concrete if the surface of the completed structure will be visible and if a fairly smooth finish is desired. Studs are usually of 2-by-4-in. size or larger, and as they bear most of the strain and pressure that is involved, good, sound lumber for these members is desirable. The placing of studs usually is about 2 ft. from center to center, although variations in either direction from this may be in order, depending upon the stresses to be met. No forms are necessary in firm soil if only small foundations are to be constructed; the trench is simply dug out to exact size and filled with concrete, taking care not to knock earth into the fresh mixture.

Some form builders cut off the wall sheeting exactly where the top of the concrete is to stop; however, this wastes materials and is useless labor unless the front sheeting adds appreciably in obtaining a true top edge. Ordinarily forms are made a few inches above where the top of the concrete is to come and the leveled "finish" position is marked off by nails driven into the sheeting a few feet apart.

Anchor Bolts

The procedure diagramed in Figs. 2 and 3 usually is followed in setting anchor bolts for machinery, sills, columns, etc. The template is made from a good, sound, flat board, accurately marked with center lines, and with holes bored through for the proper spacing of bolts. Pipe sleeves are set to provide for the later adjustment of the bolts, with the sleeve of a diameter large enough to provide a space of ½ in. or more. The space is packed with oakum to center the sleeve around the bolt and to prevent the fluid concrete, after pouring, from entering the annular space.

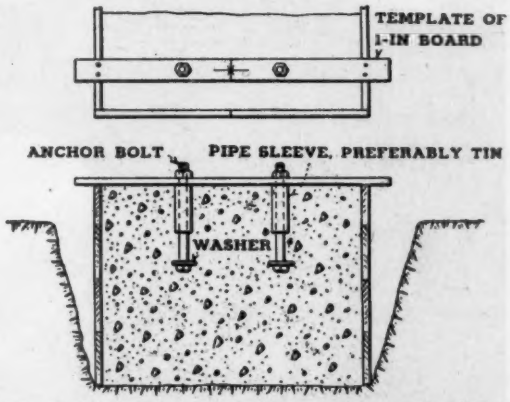

Fig. 2—Plan and cross-section showing installation of anchor bolts by a template

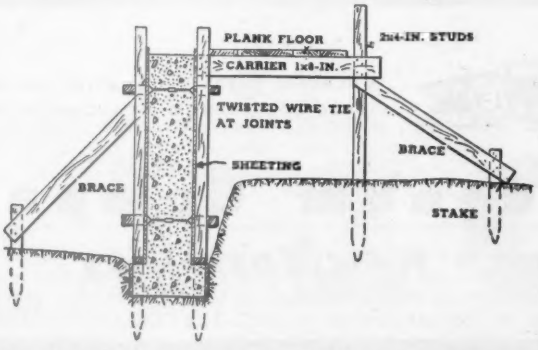

Fig. 1—Double wall form: studs tied in pairs; wheelbarrow runway

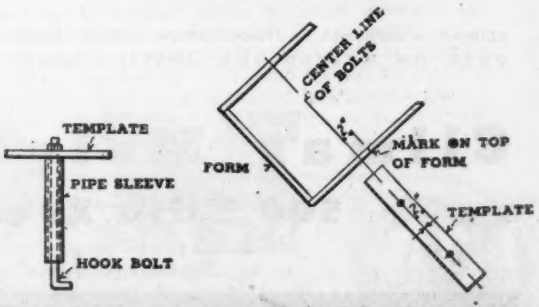

Fig. 3—Details of securing an anchor bolt and how to set a template

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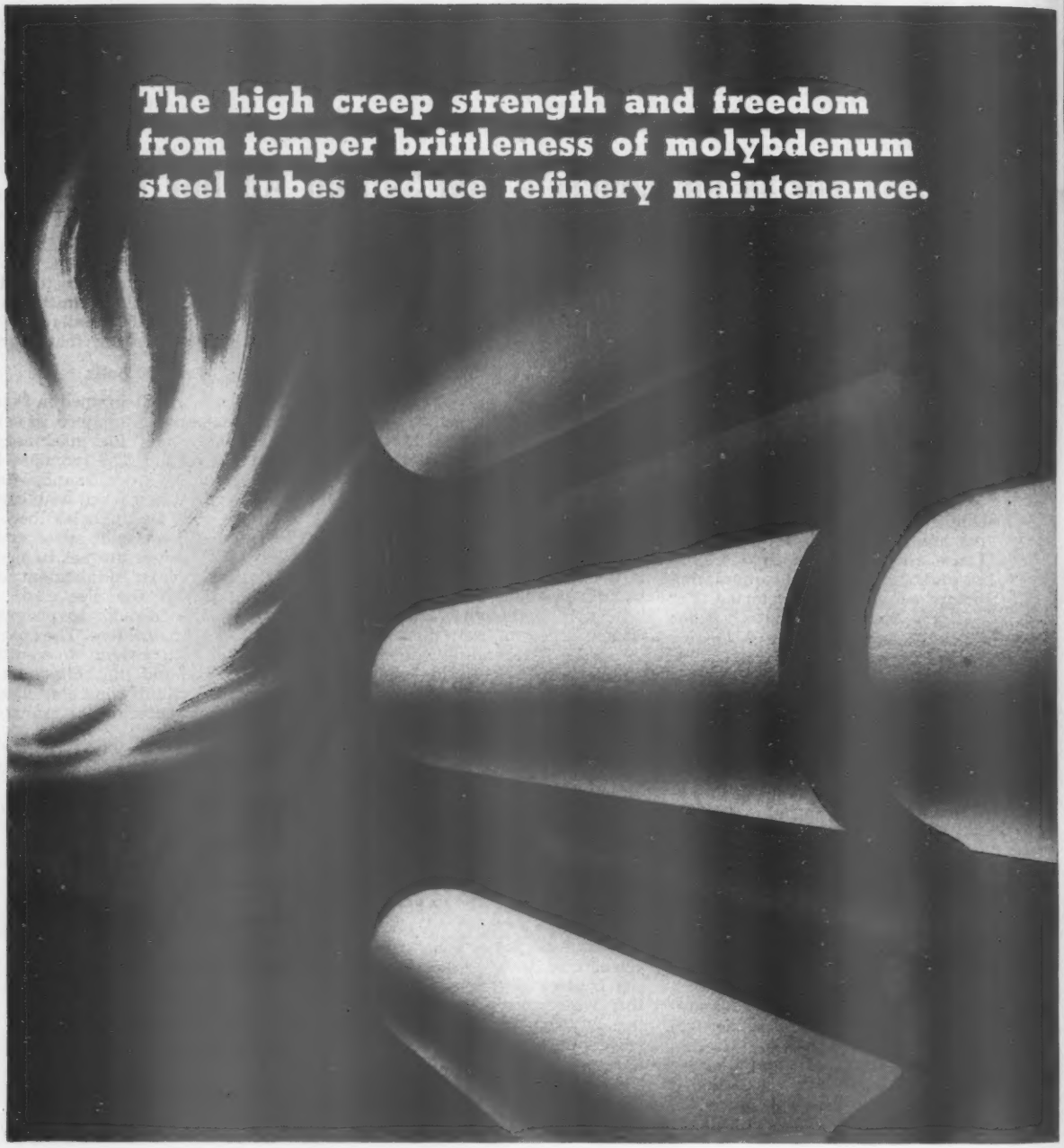

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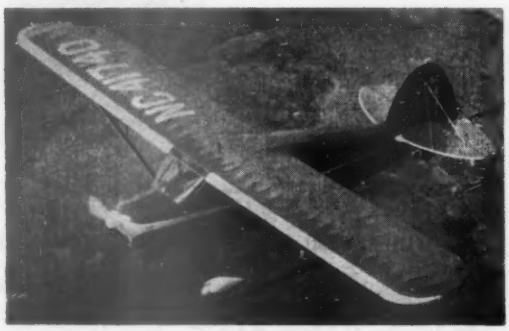
OIL AND GAS EQUIPMENT Digest

IT'S NEW CHECK IT

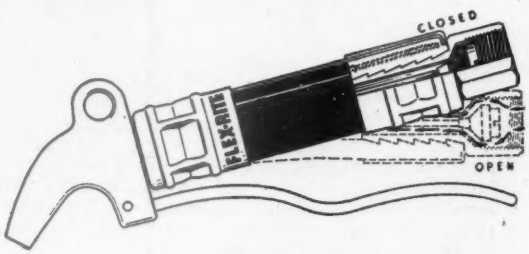
by Kenneth B. Barnes

(1) "BEE" LIGHT PLANE uses only 4.5 gal. of gasoline per hour. Cruising speed is 102 m.p.h., service ceiling 17,000 ft. Climbs 800 ft. per minute. Standard equipment includes many useful auxiliaries. Special features of safety, maneuverability, and power are incorporated throughout the engineering and construction. *Funk Aircraft Co.*



IT'S NEW CHECK IT

(2) FLEX-RITE AIR BLOW VALVE gets cleaning and blowing operations done in a hurry. Air stream can be directed to exact spot needed. Assures positive control of flow, with as much or just as little air as the job requires. No packing or springs used. *Flex-Rite Valve & Mfg. Co.*

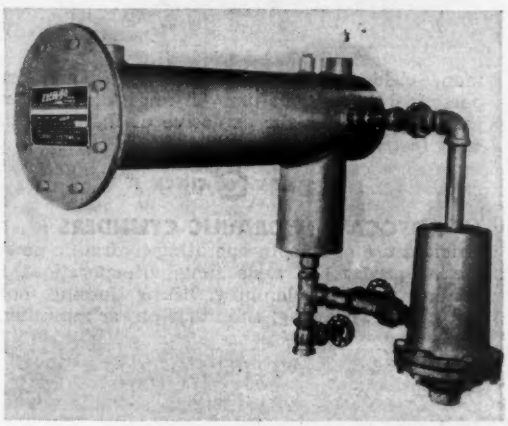


IT'S NEW CHECK IT

(3) NEW "LOW-SWING" STRAINER protects critical pumping equipment, uses perforated steel or bronze for strainer basket to give longer life. Slotted lug construction permits quick removal of basket for cleaning. Compact design. *Blackmer Pump Co.*

IT'S NEW CHECK IT

(4) EXCEL-SO WATER SEPARATOR and filter removes water and sediment from gasoline and fuel oils in storage tanks, fuel trucks, diesel engines, barges, etc. Two feet long, it easily can be mounted on trucks or in compartments. Combines coales-



cing, settling, and filtering. Water up to 6 per cent, and even in finely divided particles, can be separated out continuously, automatically. For refineries, pipe lines, other large installations, EXCEL-SO is available in sizes up to 1,500 g.p.m. *Flotrol Systems, Inc.*

IT'S NEW CHECK IT

(5) SD-2 SHOT DETECTOR is a supersensitive instrument for detecting the discharge of explosives used in shooting oil wells. Indicates instantly the time of explosive discharge by deflection of a meter hand, when explosion occurs at such depths as not to be audible to human ear. Meter hand is locked in maximum deflected position at instant shock vibrations are transmitted to pickup ele-

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

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OIL AND GAS EQUIPMENT Digest — IT'S NEW CHECK IT

ment. Adds greatly to safety of cleanout-crew personnel by elimination of uncertainty of not knowing whether the explosive discharged. *Coleman Instrument & Mfg. Co.*

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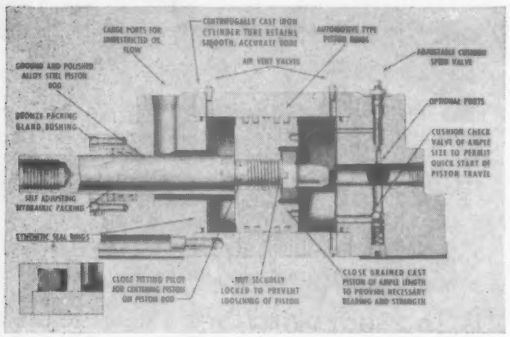
(6) ROTOCAST HYDRAULIC CYLINDERS make efficient use of smooth-operating hydraulic power, are adapted for a wide range of operations involving pushing, clamping, lifting, forcing, holding, pulling, pressing, and other power movements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CENTRIFUGALLY CAST IRON CYLINDER TUBE RETAINS SMOOTH, ACCURATE BORE
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ADJUSTABLE CUSHION SPEED VALVE
AIR VENT VALVES
GROUND AND POLISHED ALLOY STEEL PISTON ROD
OPTIONAL PORTS
BRONZE PACKING GLAND BUSHING
CUSHION CHECK VALVE OF AMPLE SIZE TO PERMIT QUICK START OF PISTON TRAVEL
SELF ADJUSTING HYDRAULIC PACKING
SYNTHETIC SEAL RINGS
CLOSE FITTING PILOT FOR CENTERING PISTON ON PISTON ROD
NUT SECURELY LOCKED TO PREVENT LOOSENING OF PISTON
CLOSE GRAINED CAST PISTON OF AMPLE LENGTH TO PROVIDE NECESSARY BEARING AND STRENGTH

in any direction. To fit the greatest number of applications, Rotocasts are offered in seven mounting types, three piston-rod models and nine standard bores. Although designed primarily for oil service, may be used for water service. Built for pressures to 1,500 psi. *Logansport Machine Co., Inc.*

IT'S NEW CHECK IT

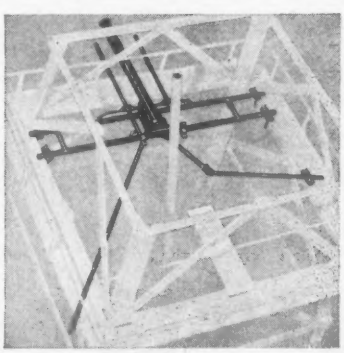
(7) LUMBER CALCULATOR instantly shows number of board feet in any size stock from ¼ in. to a beam 20 by 30 in. Easy to read and a time saver. Price three for $1. *Lawrence Engineering Service.*

IT'S NEW CHECK IT

(8) NEW "PV" PRESSURE TRANSMITTERS are applied as primary elements in indicating and recording dynamic and static pressures of gases and liquids. The sensitive element employs an unbonded strain sensitive filament. The bridge is connected and permanently balanced inside the instrument. The zero setting is independent of ambient temperatures. Can be supplied with two pressure inlets for differential pressure measurement, or with a single pressure inlet and either vacuum or atmospheric reference. Dimensions 1¼ by 2½ in. *Statham Laboratories.*

IT'S NEW CHECK IT

(9) MECHANICAL MULE HELPS DERRICK MAN. What it is: A mechanical gathering rack which catches drill pipe in the derrick. How it works: Ram moves pipe and drill collars so derrick man can handle at once. Results: Derrick man racks



pipe easily, safely and quickly. Putting on: Can be installed in hour's time on any derrick with monkey board without stopping drilling operations. Report from Odessa, Tex.: "In the Permian Basin the average number of trips per well to depths of 8,000 ft. is 120, at an average cost of $40 per hour and the resultant saving through use of the Mechanical Mule is approximately three times its cost on one well." *Mechanical Manufacturing Co., Inc.*

IT'S NEW CHECK IT

(10) COMBUSTIBLES RECORDER-CONTROLLER is a new automatic analyzer and recorder for precision control of furnace atmospheres and combustibles measurements. Responsive to changes of 0.05 per cent combustibles; sustained accuracy within 0.25 per cent. A continuous gas sample is mixed with compressed air and burned on a catalyst filament which reaches a temperature pro-

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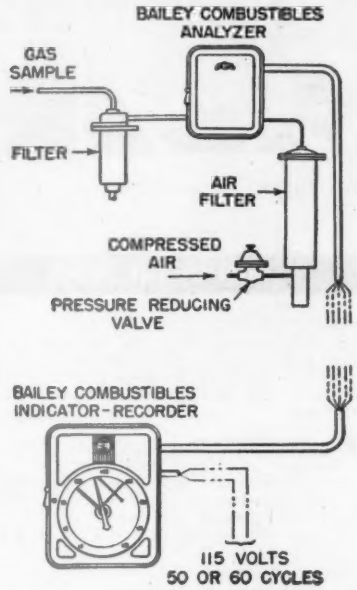
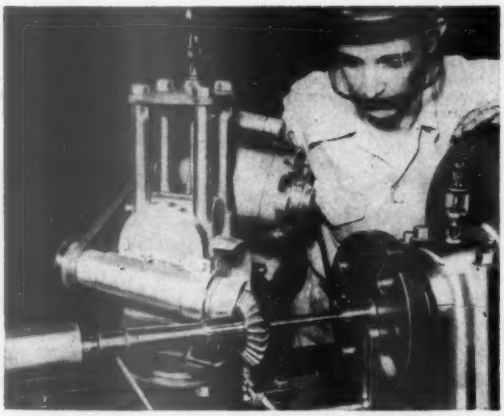
portional to the combustibles content. Since the filament resistance is a function of temperature, a simple resistance bridge connected to a null-



balance electronic recorder completes the installation. May be caibrated in per cent combustibles, mixture ratio, or other desired terms. Pneumatic control or electric alarm contacts may be provided. *Bailey Meter Co.*

IT'S NEW CHECK IT

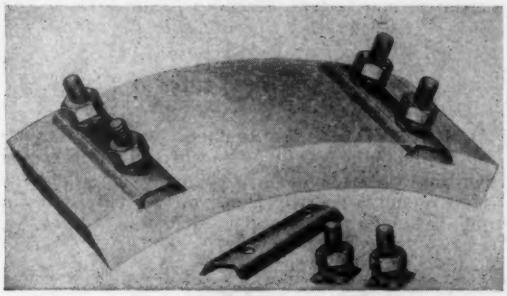
(11) MASTER LATHE CONVERTER in one auxiliary tool provides for milling operations; cylindrical, tool, surface and internal grinding; interval keyseating, high speed end milling, routing, drilling, etc. Portable, only a moment is required



to change the various heads (six styles available) to fit each new operation. Choice of seven styles of arbors. *Master Manufacturing Co.*

IT'S NEW CHECK IT

(12) KEY-LOK BRAKE BLOCKS have quick replacement features. Consist of lateral "fishtail" keepers in which bolts are inserted, spaced to fit in the brake bands. Keepers slide into fishtail slots cut into the block. The bolts, bands, or shoes



need never be removed for relining; all that need be done is to loosen the keeper nuts, slide off the old and on the new. *Raybestos-Manhattan, Inc.*

TRADE LITERATURE

(13) REFRIGERATION CATALOG. Thirty-six-page catalog deals with the application of control instruments to the refrigeration field. Divided in two sections, one dealing with applications, the other with instruments. Applications are reproduced to show processing requirements in refrigeration. Instruments are illustrated in second section. *Taylor Instrument Companies.*

IT'S NEW CHECK IT

(14) FRACTIONAL HORSEPOWER V-BELT DRIVE HANDBOOK. Forty-four-page handbook completely covers selection, horsepower ratings, general engineering data, standard FHP interchangeability list. Gives selection tables on pressed steel, cast iron sheaves. Contains service tips. *B. F. Goodrich Co.*

IT'S NEW CHECK IT

(15) TROPICAL PRE-CUT BUILDING. Bulletin illustrates and describes buildings now being manufactured. Gives specifications and uses. *Houston Ready-Cut House Co.*

IT'S NEW CHECK IT

(16) APPLICATION CHART. Letter-size, 10-page bulletin lists industries, types of proven applications and recommended grade of aluminum bronze electrodes for use in each instance. Chart is based on actual case histories. *Ampco Metal, Inc.*

IT'S NEW CHECK IT

(17) NEW GLOSSARY OF MACHINE-SHOP TERMS. Machine-shop terminology as it applies to machining of forgings clarified in 30-page bulletin. A practical aid to buyers and users of machined forgings. *Kropp Forge Co.*

IT'S NEW CHECK IT

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(18) NEW VALVE CHART. Chart tells how to renew vital parts. It pictures and gives data on brass valves showing vital parts which can be renewed. Also lists same data on iron valves. Chart is 22 in. high by 28 in. wide printed in two colors. Offers complete information on renewing parts in field, giving facts to be remembered when ordering new parts. *Reading Pratt & Cady Division, American Chain and Cable Co., Inc.*

IT'S NEW CHECK IT

(19) SWIVELS. Ring-punched, two-color, 32-page bulletin lists a complete line of swivels for every drilling requirement. Explains general features, gives general specifications, swivel rating recommendations and illustrates each one. *Emsco Derrick & Equipment Co.*

IT'S NEW CHECK IT

(20) AIRBRAKE BULLETIN. Twenty-four page bulletin on automotive air brakes discusses various types of air-brake systems. Contains schematic diagrams in three colors clearly illustrating principle used by new type compressor. Gives complete information on construction and performance characteristics. *Wagner Electric Corp.*

IT'S NEW CHECK IT

(21) DEAERATION. Twenty-page booklet discusses science of deaeration and its effectiveness in controlling corrosion. Fully illustrated with charts and photographs, the booklet describes corrosion in general and the part which deaeration plays in checking it. Has table showing the derivation of the pH factor and graph indicating effect of pH on the rate of corrosion. Also has graphs covering the solubility of oxygen and carbon dioxide in water at various temperatures. *Elliott Co.*

IT'S NEW CHECK IT

(22) PIPE HANGERS. Eight-page bulletin illustrates complete line. Also includes line of electrical clamps, Degausing steps, metal stampings. *S. R. Mickelson & Co.*

IT'S NEW CHECK IT

(23) LEVER-OPERATED GATE VALVES. A new 16-page bulletin shows industrial and process line applications. Describes in detail the features of these valves. Takedown illustrations show design and other important features. Illustrated. Gives dimensions, weights, list prices. *Everlasting Valve Co.*

IT'S NEW CHECK IT

A. VAN CAMPEN *A. R. HAUSER* *E. L. BYER*

MEN IN THE NEWS

Avery Van Campen, who for the past 10 years has been employed by Clark Bros. Co., Inc. in their experimental, engineering and sales departments at Olean, N Y., has been appointed to the New York sales office as district engineer.

A. R. Hauser succeeds the late John McClain as joint district manager of Clark Bros. Co., Inc. and Pacific Pumps, Inc. Chicago offices, 122 South Michigan Avenue, Chicago. Hauser comes to his new duties after 10 years of engineering service in the engineering department of Pacific Pumps, Inc. of Huntington Park, Calif.

Expansion in organization, personnel, and service facilities has been announced by Crawford Tank & Supply Co. from their general offices in Dallas, Tex. **E. Lloyd Byer,** the new head of Crawford, in outlining the company's expansion program stated it was designed to keep pace with postwar reconversion and expansion policies of the oil and allied industries Crawford serves. **J. E. Hobson,** representative at Odessa, Tex., the past 2 years, succeeds Byer as vice president. Some of the managers and representatives in the expansion program are as follows: At Houston, **E. G. Murphy, M. A. Lamkin** and **O. R. Pickering;** at Dallas, **L. V. Gibson** and **C. A. Gilson;** at Fort Worth, **A. F. Nixon;** at Corpus Christi, **Ivan Cash** and **Edward Breedlove;** at Odessa, **P. P. Shaw;** at LaFayette, La., **G. C. McClatchey;** at New Orleans, La., **J. M. Morlan;** at Laurel, Miss., **Edward Miller;** at Tulsa, Okla., **G. G. Byer;** at Hobbs, N. M., **R. G. Brasher;** and at Great Bend, Kan., **E. E. McDonald.**

G. A. Tompson, vice president of American Well and Prospecting Co., a subsidiary of Bethlehem Steel Corp., announces the appointment of **I. C. Smith** as plant manager at Corsicana, Tex. He succeeds **J. E. Rittersbacher,** who has resigned after 25 years with the company and prior to its acquisition by Bethlehem was president. Also announced is the appointment of **Lee Fagg** as chief engineer. Fagg is located at the company's plant at Corsicana.

J. E. HOBSON *I. C. SMITH* *LEE FAGG*

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

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Get into profitable production quickly.... contract with American for parts and assemblies.

The "cream" of peacetime markets is going to alert manufacturers who get their products on the market early. Here is where you can profit by allotting your parts production to American.

Ready to go to work for you NOW are the facilities of the largest Army-Navy shell plant in the oil country... the plant that made more different sizes of shells than any other single plant in the nation. Twenty-one years of manufacturing oil field equipment, plus four years of intensive ordnance production means we have the "know-how" and equipment to produce steel and iron parts and components of any type or size in any quantity... made to your own specifications and subject to approval of your own inspectors.

Get your product on the market in volume and on time by contracting with American NOW for parts and assemblies. Write, wire, or phone TODAY for information and quotations.

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Unit Pumpers	•	Pumping Jacks	•	Swings	•	Crown Blocks	•	Bull Plugs	
Swaged Nipples	•	Casing Nipples	•	Tubing Nipples	•	Braden Heads	•	Turnbuckles	

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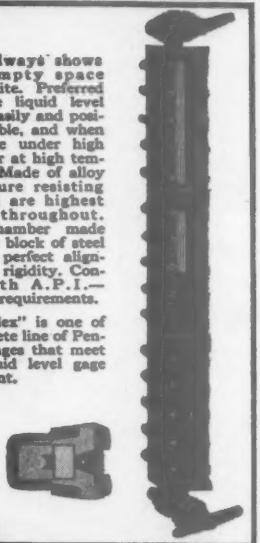
"REFLEX"
DROP FORGED STEEL
LIQUID LEVEL GAGES

Liquid always shows black—empty space shows white. Preferred where the liquid level must be easily and positively visible, and when liquids are under high pressure or at high temperature. Made of alloy temperature resisting steel and are highest quality throughout. Liquid chamber made from solid block of steel to assure perfect alignment and rigidity. Conform with A.P.I.—A.S.M.E. requirements.

The "Reflex" is one of the complete line of Penberthy Gages that meet every liquid level gage requirement.



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IT'S NEW — THE HOLAN 2-TON WINCH

Front view of Holan 2-ton Winch

The Latest Development In Compact, Easily Operated Winches — Tops in Quality

Small and compact, this winch is exceptionally easy to operate and very efficient. Two speed ratios permit handling heavy loads at slow speeds and light loads at high speeds. Perfect control is assured for raising load. When lowering load, control is secured by a single shoe hand brake that has sufficient capacity to hold full load. Full rated load is 4000 lbs., but each winch is tested at factory by applying a load of approximately 6000 lbs.

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REFINING

Louisiana's Gasoline Tax $239,776,748 in 24 Years

BATON ROUGE.—Louisiana's gasoline tax has yielded the state $239,776,748 since it was adopted in 1921, records in the treasurer's office reveal. The tax, 1 cent a gallon at the start, was raised to 2 cents in 1924, 4 cents in 1928, 5 cents in 1930, and 7 cents—the present rate—in 1936.

Louisiana's highway users' greatest contribution was in 1941, when total receipts from the tax amounted to $21,434,040.21. Use of highways fell off during the war.

Use of gasoline taxes for purposes other than highway maintenance and construction began in 1930 when $155,000 was diverted. Such diversion increased to a high of $8,217,000 in 1939.

During the fiscal year of 1944-45 Louisiana's 64 parishes received $2,595,162 from gasoline tax funds.

Gulf Coast Gasoline Stocks Continue Their Rise

HOUSTON.—Stocks of all gasolines and naphthas at plants in Gulf Coast Refiners Association rose 121,977 bbl. in the first half of November, standing at 1,437,664 on November 15. Automotive gasoline inventories were 689,088 bbl., off 125,817. Total stocks of all products were 3,364,954 bbl., off 287,020. A year ago these totaled 4,106,114. Crude runs during the first 2 weeks of the month totaled 103,363 bbl. daily, 80 per cent of rated capacity.

National Refining Acquired By Gilroy and Associates

CLEVELAND.—Directors of National Refining Co. last week approved sales of the company's oil business and oil properties to Wallace Gilroy and associates for a reported consideration of "about $3,000,000." Transfer of the assets involved will take place about January 1. The company then will change its corporate name and "expand its activities in the textile and other fields."

Gilroy is president of Interstate Gas Co. and Interstate Pipe Line Co. of Lee's Summit, Mo., and formerly was president of Imperial Refining Co., Grand Rapids, Mich., later becoming chairman of the executive committee of Mid-West Refineries, Inc.

The new company to be organized by Gilroy and his associates will continue marketing of National's brand products, and it is planned to improve and modernize the company's refinery at Findlay, Ohio, which has a crude-oil capacity of 9,200 bbl. and cracked-gasoline capacity of 3,200 bbl.

Spherical Catalyst May Reduce Gasoline Cost

CHICAGO.—Using a 19-story elevator shaft for their experiment, scientists of Standard Oil Co. of Indiana found they could produce a synthetic catalyst in the form of tiny baseballs, instead of tiny doughnuts, with the result that substantial savings in manufacture of high-octane gasoline are in prospect. When billions of the microscopic catalysts are blown into a tank with hot oil vapors they crack the heavy molecules of the oil, and high octane is produced.

One method of obtaining the experimental synthetic catalyst was to spray it as a solution at the top of a tower and collect the crystallized particles which settled at the bottom. The particles, however, came out ring shaped; more likely to crush under repeated usings than if they were solid.

The scientists thought a higher tower might solve the problem, so, to find out, they went to the company's general office building in Chicago, pulled an elevator out of

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service, and used the shaft as a substitute tower.

The solution was sprayed into the shaft, and particles that settled into a box at the shaft's bottom were found to be perfect spheres. Experiments with the ring-shaped catalyst showed losses of several tons of powder each day in a single 20,000-bbl. unit. The catalyst costs $300 a ton.

To put this discovery to use, the company says, may not require the building of a 200-ft. tower since the same result probably can be gained by dropping the catalyst vapor through a smaller tower, with warm air flowing upward to dry the particles quickly.

Wolf Creek Oil Bought by Consumers Cooperative

KANSAS CITY.—Wolf Creek Oil Co., Wichita, Kans., has been purchased by the refining subsidiary of Consumers Cooperative Association, Howard A. Cowden, president of the cooperative, announces.

Forty-six wells, producing approximately 1,100 bbl. of crude daily, and some 12,000 acres of undeveloped leases, were acquired in the purchase. The wells, located in Butler, McPherson, Saline, and Russell counties, Kansas, bring to 436 the total number of producing wells owned by the association. The cooperative, which owns three refineries and an interest in a fourth, will now be able to produce 25 per cent of its crude oil requirements, Cowden said. Last year it marketed 21,544 carloads of refined fuels to 907 member associations in nine states.

Principal shareholders in the independent oil-producing company were O. E. Sutter and Ebin Pyle. Most of the wells have been drilled since 1940. Their output will go to the co-op refinery at Coffeyville, Kans.

Minnesota Order Tightens Control of Oil Shipments

ST. PAUL. — Stricter control of shipments of oil products will be achieved through an order, issued for tax purposes, by G. Howard Spaeth, state tax commissioner of Minnesota. The order decrees that "consignments and reconsignments of petroleum products originating outside the state of Minnesota, or pipe lines, refineries or river terminals in the state, can only be received and unloaded at stations registered by licensed distributors and approved by this department as unloading points."

"The ODT wanted to conserve rubber," said a tax division official, "so some trucks have been permitted to by-pass bulk plants and dump loads at different points. When they get into that type of practice it is more difficult to follow the loads. The revenue is assessed on the inshipments and our control is based on records of loadings. We're just trying to get back to the old methods of doing business, now that the war is over."

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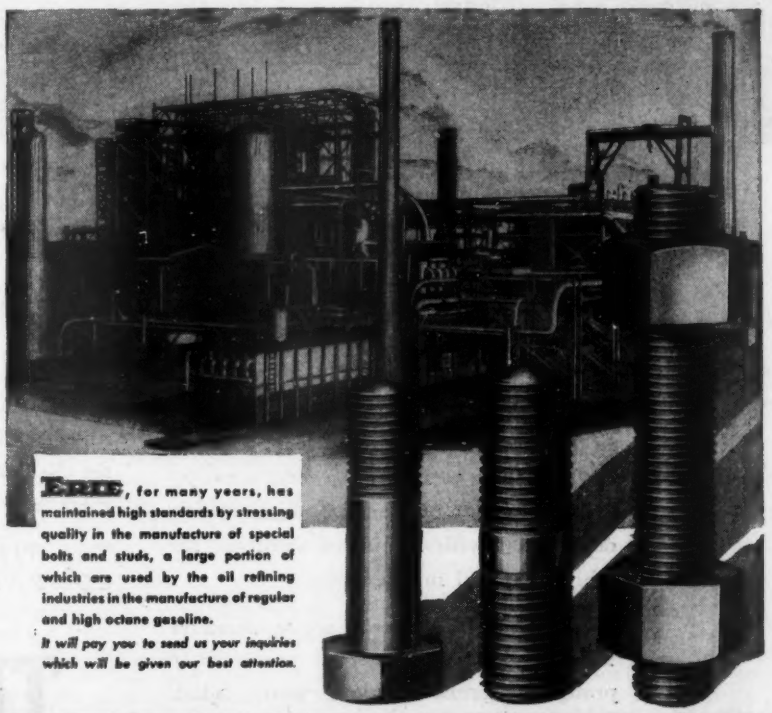
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Natural Gas

FPC Refuses Reynosa's Request for Depositions

WASHINGTON. — Federal Power Commission has refused Reynosa Pipe Line Co.'s request for an order to take the depositions of Olin Culberson, Ernest O. Thompson, and Beauford Jester, members of the Texas Railroad Commission, concerning the company's application for authority to export up to 60,000,000 cu. ft. of natural gas a day from Texas to Mexico.

Hearing is scheduled for December 12 in Washington on the company's application. Members of the Texas Railroad Commission have been granted permission to participate in the hearing.

The order of denial stated issuance of an order to take the depositions would be inappropriate under the Natural Gas Act, the cooperative agreement between FPC and National Association of Railroad and Utilities Commission, and the commission's provisional rules of practice and regulations.

FPC officials pointed out that under the Natural Gas Act the testimony of a witness may be taken at the instance of a party in any proceeding that is at issue, upon notice, without an order of FPC.

Gas-Rate Case Goes Back To Utilities Commission

PHILADELPHIA.—The Pennsylvania Superior Court has sent back to the Public Utilities Commission the rate case involving The Peoples Natural Gas Co. It was the third time the case had been before the court.

The city of Pittsburgh, plaintiff, contended that the commission in orders of February 16 and July 24, 1944, had failed to establish reasonable tariff rates. A split decision, written by Judge William E. Hirt, said the case was being returned to the commission because the court had reversed an opinion and because the commission failed to carry out a directive of the court.

The Peoples Gas Co., as intervening appellee, was directed to make reparations to consumers served during 1942 and 1943 "by repayment to them of a total of $500,000," the opinion stated.

In the last appeal, the court approved certain "expense items," which the commission would not consider. "We have reconsidered," Judge Hirt said, "and now are convinced that the commission was right and we were wrong."

Northern Natural Granted Limited Selling Rights

WASHINGTON. — Northern Natural Gas Co. has received from Federal Power Commission limited authority to sell natural gas in Boone, Iowa, through existing facilities to Iowa Electric Light & Power Co. for use at its Boone power plant. Use must be confined to pilot burners, etc. An application for permission to sell gas for use as boiler fuel was dismissed without prejudice. Testimony showed that the Boone plant can be operated with coal.

The order is not to be construed to prevent application for authority "to operate the facilities herein authorized in order to sell additional quantities of natural gas to Iowa Electric for distribution in the City of Boone, in place of the mixed gas served by it."

Companies Seek to Renew Waning Gas Supplies

PORT ALLEGANY, Pa. — At a hearing November 26 in reopened proceedings of Hope Natural Gas Co. and New York State Natural Gas Corp. to sell gas wholesale for northern Pennsylvania and western New York areas in order to make up for declining supplies, Federal Power Commission took a transcript of testimony and will announce its decision later.

Testimony on an application of Dempseytown Gas Co. to extend facilities to serve several northern Pennsylvania counties was heard. This company purchases its gas from Hope Natural and Hope in turn purchases from New York State Natural.

The Dempseytown company wants permission to buy 1,000,000 cu. ft. of gas from New York Natural daily to offset declining supplies.

Hope Natural and New York State Natural, both subsidiaries of Consolidated Natural Gas Co., are now limited to supplying customers of New York State Natural with certain maximum volumes of gas.

The petition filed by Hope Natural asks that limitations imposed be lifted to permit it to deliver to New York State Natural such increased quantities of natural gas as are necessary to enable it to meet requirements of the Dempseytown company and the additional requirements of Empire Gas & Fuel Co.

Mississippi River Fuel Is Ordered to Reduce Rates

WASHINGTON. — Federal Power Commission has directed Mississippi River Fuel Corp. to reduce its wholesale natural-gas rates by not less than $945,613 annually, or about 27 per cent. The commission's order allocates the company's costs between its regulated sales to utilities and nonregulated sales for industrial use only and fixes the fair rate of return for the company's regulated sales at 6 per cent.

The company is ordered to file rate schedules reflecting the reduction. Such schedules shall be effective as to all bills based on meter readings made after January 14, 1946. When the commission's order of April 27, 1943, reducing the rates of Interstate Natural Gas Co. by $301,329 is validated by the courts, Mississippi is to pass on the proper portion of that reduction by lowering is rates to utility customers.

Mississippi River Fuel Corp.'s principal market is St. Louis, but there are seven utility customers in Arkansas, Missouri, and Illinois. The order establishes as reasonable a commodity rate of 13 cents per 1,000 cu. ft. for firm gas sales to the utility customers, aggregate demand charges of $764,269 based on 1943 billing demands, and 14 cents per 1,000 cu. ft. for interruptible sales to utilities for resale.

Natural Gasoline

Texas Supreme Court Will Review Butane-Gas Case

AUSTIN. — The Texas Supreme Court has agreed to review litigation involving the questions of whether butane-gas reservoirs constitute a nuisance and whether the State Railroad Commission has authority to pass on their locations.

Two of several errors alleged by counsel were admitted for review by the court. One was that the butane-gas regulatory act does not give the Railroad Commission authority to pass on locations for gas reservoirs or to decide whether such locations constitute a nuisance as to property rights. The other was that such installations constitute a menace to property and to persons living near.

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PIPE LINES

South Texas Line Delivers to McBride

A 17-mile pipe line built at a cost of $65,000 by South Texas Pipe Line Co. has been put in operation recently to transport Starr County crude oil from the Continental Pipe Line Co.'s trunk line south of Donna to McBride Refining Co. at La Blanca, east of Edinburg, Tex. The South Texas line is owned by H. L. McBride of La Blanca, Tex.; A. B. White of Harlingen, Tex., and J. F. Whitehurst of Corpus Christi, Tex., who also own the McBride refinery.

The line from Donna to the refinery will have a capacity of 2,400 bbl. daily and will pump an average of 1,800 bbl., said McBride.

This is the second pipe line to be built from the Conoco trunk to a valley refinery. A 5-mile line was recently installed near McAllen to connect Rado Refining Co. there with the trunk line.

Stanolind Promotes Scott and Aude

Stanolind Pipe Line Co. has recently promoted C. M. Scott, Jr., to general superintendent after long service as chief engineer, and T. R. Aude to the position of chief engineer from that of assistant chief engineer.

J. J. Boyd Joins O. E. Dempsey Firm

Oscar E. Dempsey announces that J. J. Boyd has become partner and general manager of O. E. Dempsey Construction Co. Boyd left the position of general superintendent for Stanolind Pipe Line Co., which he assumed July 1, 1945, after more than 14 years of service with the company.

Pittsburgh Corrosion Forum Is Organized

PITTSBURGH. — The Corrosion Forum has been recently organized here for studying corrosion conditions in the area. Affairs of the group are being handled by Richard Rimbach of the temporary steering committee, 1131 Wolfendale Street. At the Jaunary 14, 1946, meeting, D. B. Williamson, Peoples Natural Gas Co., will discuss pipe-line corrosion.

Research Study of Gas Dehydration

Large-scale experimental studies to improve the equipment for natural-gas pipe lines are conducted by the Engineering Experiment Station, University of Colorado, for Stearns-Roger Manufacturing Co.

Two 14-ft.-high reaction towers are part of the equipment erected last week at the laboratories of the station as the research engineers under Dr. J. E. Stepanek, assistant professor of chemical engineering, began assembling the equipment for the projects.

"We are trying to develop improved methods for removing water vapor from natural gas so that the pipe lines won't freeze up and

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stop the flow," Dr. Stepanek explained. Even on days when the temperature is above the normal freezing temperature, high-pressure gas lines will freeze and plug if there is too much water vapor present in the gas.

The research engineers will also do pilot-plant studies on the efficiency of other types of equipment used in high-pressure gas transmission.

Supreme Court to Consider Champlin Carrier Status

Further action will be taken in the case of Champlin Refining Co. against Interstate Commerce Commission only when a full U. S. Supreme Court hearing is ordered. Because of the importance of the proceedings this will be delayed until the return of Justice Robert H. Jackson from the war-criminal trials in Germany. The case is significant in its bearing on the further establishing of the public utility aspect of interstate pipe-line transportation.

The present contention of the Government is that the pipe line constructed by Champlin Refining Co. in 1935, to carry its own gasoline from Enid, Okla., to Kansas and Iowa markets, by virtue of transportation across a state line automatically becomes a common carrier subject to the Interstate Commerce Act, must file tariffs and transport the gasoline of competing refineries if so called upon.

Champlin Refining Co. contends, on the other hand, that if Champlin is the owner of property which is not devoted to public use and utility, then to place this pipe line under the jurisdiction of Interstate Commerce Commission is, per se, taking over property without due process of law, in violation of the federal constitution.

In 1941, ICC set out to make a test case of its pipe-line jurisdiction in an order to proceed against either Champlin Refining Co. or Standard Oil Co. (Indiana). After hearings before the entire commission, Champlin was held to come under the Interstate Commerce Act as a common carrier. This, the company is protesting before the higher court.

Champlin declares in support of its private-carrier position, that no tariffs have ever been filed with ICC or any state regulatory bodies; the right of eminent domain has never been exercised and it has never made exchanges of products in the operation of the line.

Mid-Continent Loops Line From Moore Area

Mid-Continent Petroleum Co. began work this week for laying 8 miles of 6-in. pipe to loop its 16-mile line from the Moore area to Oklahoma City. Additional pump equipment has recently been installed at the field station to handle the increased production resulting from development operations in the area.

U. S. to Remove Lines in France

Because the French Government would not meet an American Foreign Liquidation Commission price of $2,500,000 in cash, American Army engineers have begun dismantling the 505-mile Rhone Valley pipe line that fed more than 3,000,000 bbl. of gasoline and oil to the Allied armies from the Mediterranean coast to Germany.

Liquidation Commission officers thought they would have a better chance of selling component parts of the line, including 68 pumping stations, special telephone communications, pipe and maintenance vehicles. The original cost to the Army was $8,500,000. French authorities, who offered less than half of the value estimated by American appraisal experts, said they had no great need for the pipe line.

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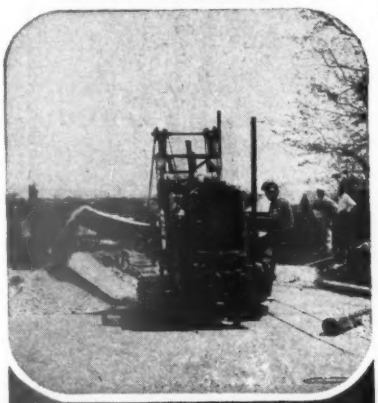

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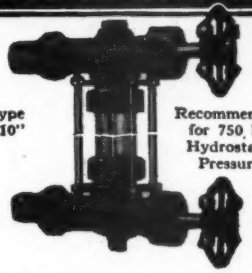

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Exploration and Drilling

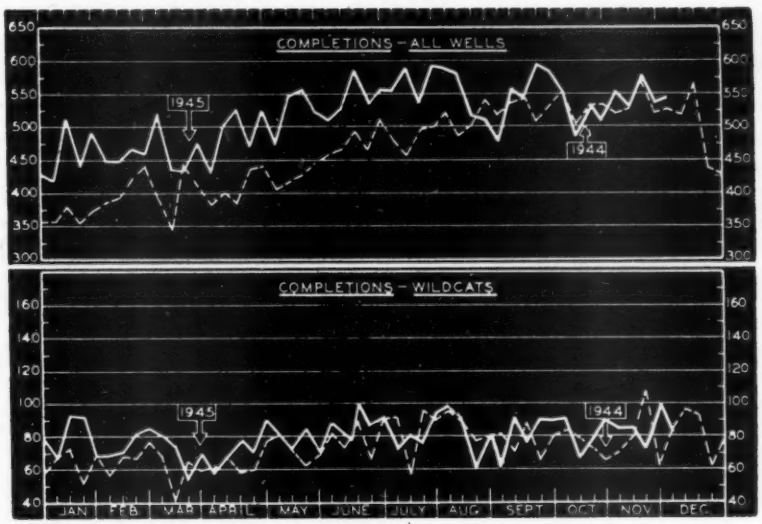
Week's Highlights

The Bandini area in the Los Angeles district is in the midst of one of the most feverish wildcat plays in the 20 years that has seen one play after another, in vain attempts to locate the oil field that most geologists felt was present somewhere nearby. During this period about 22 wildcats have been completed, most of them stopping, however, around 6,000 ft.

Currently there are four wildcats drilling, Richfield Oil Corp. 1 Union Pacific in 9-2s-12w, Richfield on the Simons in 15-2s-12w, Chanslor, Canfield, Midway Oil Co. in 21-2s-12w, and C. G. Willis in 23-2s-12w. Of these, the Richfield Union Pacific test is the hottest, and may be opening a new pool.

After drilling to total depth of 8,608 ft., and finding several thin sand lenses, in which cores showed oil, casing was set at 8,571 ft., and a 3-hour test was made. This showed a flow at the rate of 750 bbl. per day net of 32° gravity oil, with a water cut of 42 per cent. Last reports were that the company was attempting to determine the source of the water, in order to decide whether squeezing off water would leave enough pay to justify another test. If it is decided that water shutoff would not leave enough pay section, the test will probably be drilled deeper, hoping to pick up another pay section.

Richfield's second test, in 15-2s-12w, is probably drilling well below 5,000 ft., while C. G. Willis has already landed 7-in. casing at 8,195



Solid line charts current weekly completions—service wells included

WEEKLY WELL COMPLETIONS . . . WEEK ENDED DECEMBER 1, 1945

	Total of all wells					Cum. to date		Wildcat completions and discoveries					Cumulative total, 1945				
	Comp.	Oil	Gas	Dry	Footage	1945	1944	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	30	15	0	*15	44,386	1,357	1,481	0	0	0	0	0	0	0	0	0	0
Pennsylvania	73	36	4	†33	119,666	3,723	3,883	0	0	0	0	0	0	0	0	0	0
West Virginia	19	0	17	2	56,022	746	834	0	0	0	0	0	0	0	0	0	0
Ohio	16	1	6	9	38,958	910	936	0	0	0	1	1	0	0	14	58	72
Indiana	4	2	0	2	6,941	181	238	0	0	0	0	0	7	0	0	25	32
Kentucky	17	9	2	6	35,070	530	714	0	0	0	1	1	23	0	4	49	76
Illinois	35	24	0	11	86,623	1,670	1,803	2	0	0	5	7	51	0	0	293	344
Michigan	16	5	2	9	40,484	697	629	0	0	1	5	6	11	0	5	261	277
Kansas	47	22	11	14	153,281	1,619	1,711	2	0	1	7	10	35	0	15	317	367
Neb., Mo., Iowa	0	0	0	0	0	28	35	0	0	0	0	0	0	0	0	18	18
Oklahoma	56	32	5	‡19	201,441	2,215	1,703	0	0	0	9	9	76	3	18	328	425
Texas	153	86	6	61	649,981	6,606	5,214	2	0	0	36	38	193	15	53	1,185	1,446
North Central	62	33	2	27	157,695	2,022	1,374	0	0	0	13	13	70	0	5	419	494
West	29	21	0	8	166,771	1,612	1,472	1	0	0	4	5	52	1	0	235	288
Panhandle	9	5	3	1	32,864	504	277	0	0	0	1	1	0	0	1	7	8
Eastern	11	5	1	5	56,451	350	297	0	0	0	4	4	6	8	2	82	96
Gulf Coast	34	19	0	15	209,587	1,541	1,169	1	0	0	9	10	51	5	34	271	361
Southwest	8	3	0	5	26,613	477	625	0	0	0	5	5	14	1	11	171	197
Louisiana	19	11	1	7	103,944	1,001	750	1	0	0	2	3	32	4	6	115	157
Northern	12	6	1	5	38,349	434	302	0	0	0	2	2	8	1	6	68	83
Southern	7	5	0	2	65,595	567	448	1	0	0	0	1	24	3	0	47	74
Arkansas	6	4	0	2	18,628	166	197	0	0	0	1	1	2	0	0	35	37
Mississippi	6	4	0	2	37,924	339	145	0	0	0	1	1	6	0	0	113	119
Southeastern States	2	0	0	2	12,009	56	49	0	0	0	2	2	1	0	1	37	39
Montana	1	1	0	0	1,417	293	325	0	0	0	0	0	10	0	0	24	34
Wyoming	5	4	0	1	25,436	210	164	0	0	0	0	0	18	0	1	44	63
Colorado	0	0	0	0	0	51	32	0	0	0	0	0	1	0	1	11	13
New Mexico	8	6	0	2	29,168	385	368	0	0	0	0	0	10	0	6	59	75
California	29	20	1	8	109,984	2,059	1,846	0	0	0	2	2	4	0	2	215	221
Total United States	542	282	55	205	1,771,363	24,842	23,057	7	0	2	72	81	480	22	126	3,187	3,815
Total previous week	531	245	63	223	1,803,027	24,300	22,557	7	1	6	86	100	473	22	124	3,115	3,734
Total Dec. 2, 1944	557	277	74	206	1,824,887	23,057	16,487	11	0	3	70	84	419	26	115	2,989	3,549

Service wells included: *15, †31, ‡1.

ft. in his test in Section 23. Many geologists think there is a good chance that the Bandini area may turn up the biggest discovery in California since Wilmington.

The Union Pacific Railroad Co. is watching the results with great interest, because if oil is not found, its land is considered good industrial development property, but if oil is found, will have even higher value. Seaboard Oil Co. has about 60 acres in the area, Pacific Western Oil Co. has around 60 acres, General Exploration Co. of California and General Petroleum Corp. have nearly 100 acres each.

SOUTH LOUISIANA

New Field Discovery Flowing High-Gravity Oil

NEW ORLEANS.—New field discovery in Calcasieu Parish is Union Sulphur Co., Inc. 1 Bordages, located in Section 5-10s-9w. Drilled to a total depth of 8,616 ft. with 5½-in. casing set on bottom, this well was plugged back to 8,497 ft. and perforated with 60 holes at 8,480-90 ft. It is flowing 61 bbl. of high-gravity oil daily with a gas-oil ratio of 23,476 to 1, through a 13/64-in. choke, with 2,200 lb. pressure on the tubing.

Humble Oil & Refining Co. 1-B Mrs. J. A. Bel estate, wildcat in the Oberlin area of Allen Parish, 33-5s-4w, is drilling ahead from 13,099 ft. in hard sand. This test is credited with several sands showing gas and condensate, and a couple showing oil. Salt water sand was reported around 12,900 ft. It is in the lower Wilcox formation.

On the west flank of the Napoleonville dome, Assumption Parish, Falcon-Seaboard Drilling Co. 1 Ed Hebert, recovered oil and salt water on a drill-stem test at 6,830-38 ft., with working pressure of 1,025 lb. Operators are now preparing to run tubing for production test.

Humble 1 C. Ellis Henican et al, a semiwildcat test in the Bayou Penchant area, Terrebonne Parish, 35-10s-13e, is considered dry at a total depth of 11,500 ft.

There were 10 new locations reported, four of which were wildcats, 1 each in Assumption, Calcasieu, Lafayette, and St. Mary parishes. Of the seven completions only one was a wildcat, a new oil pool opener in Calcasieu Parish. St. Martinville field showed the most activity, receiving two completions.

SOUTH LOUISIANA SUCCESSFUL WILDCAT

Calcasieu Parish: New oil pool—Union Sulphur 1 Bordages, 5-10s-9w, TD 8,616 ft., PB 8,497 ft., perf. 8,480-90 ft., PT 61 bbl. per day through 13/64-in. choke, gas-oil ratio 23,476, TP 2,200 lb.

TEXAS GULF COAST

Hardin County Discovery Flows 596 Bbl. Potential

HOUSTON. — Pan American Production Co. 1 Olive Sternberger Lumber Co., discovery well of Kountze field, Hardin County, flowed a potential of 596 bbl. of 44-gravity pipe-line oil through a 14/64-in. tubing choke. Pressure on tubing was 3,500 lb., with casing sealed. This well, in P. S. Watts Survey, 6 miles north of Kountze, was drilled to a total depth of 10,049 ft. and production is from open hole at 9,954-10,049 ft. in the Wilcox formation. The 7-in. casing was set at 9,954 ft., with 2½-in. tubing at 9,743 ft. Pan American is preparing location for its confirmation test 2 Olive Sternenberger Lumber Co., about ½ mile northwest of the discovery well. This test is in the J. Landis Survey, Abstract 382, Section 6, and is scheduled to be drilled to 12,000 ft.

Glenn H. McCarthy 1 Lewis Follett et al, northeast outpost test at Blue Lake field, Brazoria County, in George Robinson League, is dry at a total depth of 9,450 ft.

Stanolind Oil & Gas Co. 6-A E. K. Cade, Abbount "B", a semiwildcat test on the southwest flank of the High Island dome, Galveston County, in W. M. Hudson Survey, is dry at a total depth of 6,627 ft.

There were 17 new locations reported this week with 3 being wildcats, 2 in Fort Bend County and 1 in Jackson County. Fort Bend and Jefferson counties received the greatest number of new tests with three each. Seventeen tests were completed, five of which were wildcats, one successful pool opener in Hardin County, and four dry holes, one each in Colorado, Fort Bend, Grimes, and Polk counties. Polk and Wharton counties each received two completions to share the lead in this district.

UPPER GULF COAST SUCCESSFUL WILDCAT

Hardin County: New oil pool, Kountze area — Pan American Production 1 Olive Sternenberg Lumber Co., P. S. Watts Sur., Abst. 571, 6 mi. N Kountze, top of Wilcox sand 10,012 ft., TD 10,049 ft., producing through open hole 9,954-10,049 ft., PT 596 bbl. per day through a 14/64-in. choke, gas-oil ratio 4,359, tubing pressure 3,500 lb., casing sealed, gravity 44°.

UPPER GULF COAST WILDCAT FAILURES

Colorado County: Great Lakes Carbon Corp. 1-C L. E. Brownson, West Garwood area in Asa McClure Sur., dry at 6,208 ft.

Fort Bend County: Jack W. Frazier 1 G. W. Trone estate, Long Point area, H&TC Sur., Abst. 238, Sec. 67, 5 mi. SE Needville, dry at 4,926 ft.

Grimes County: J. H. Woodard, Jr. 1 Mrs. Edna Kelly et al, E. Anglin Sur., 4½ mi. E Anderson, dry at 3,005 ft.

Polk County: Brooks & Lively 1 De La Cattle Co., R. Lynch Sur., Abst. 389. (core test), dry at 2,250 ft.

SOUTHWEST TEXAS

New Frio Sand Pool Opened in Starr County

CORPUS CHRISTI.—A new oil field has been opened by W. H. Holland 1 M. M. Garcia, located in Block 26, Porcion 91, about 15 miles northeast of Rio Grande City, in Starr County. This discovery is flowing an estimated 175 bbl. of 42-gravity oil per day through a ¼-in. choke, tubing pressure 375 lb., casing pressure 1,150 lb., with gas-oil ratio 276 to 1. As yet potential test has not been run. The total depth is 4,520 ft., with the 5½-in. production pipe cemented at 3,614 ft. Production is from the lower Frio sand through 56 perforations at 3,498-3,512 ft. Holland has staked two new locations in this area, his 2 Garcia on Block 13, Porcian 90, and his 3 Garcia on Block 12, Porcion 12, both west of the new producer.

In Atascosa County, Humble Oil & Refining Co. 1 Henry Schorsch, wildcat ¾ mile southwest of Jourdanton, is waiting on cement to set with 5½-in. production casing set on bottom at total depth 7,405 ft. This test showed gas and condensate at various levels in a series of tests from 7,277 ft. to total depth with the last test at 7,395-7,405 ft. recovering a little salt water. No water was reported in any of the other tests.

Blanco Oil Co. and Al Buchanan 1 A. M. Bruni estate, prospective pool opener, in Albercas Grant, Block 28, Brown Subdivision, about 8 miles southwest of Bruni in Webb County, recovered pipe-line oil

(Continued on page 144)

DAILY AVERAGE PRODUCTION FOR WEEK

	Dec. 1 crude oil	Bureau of Mines demand forecast	State allowable	Nov. 24 crude oil
Alabama	700	100	.....	550
Arkansas	76,000	78,000	.....	76,300
California	840,500	860,000	880,000	845,200
Colorado	14,400	12,000	.....	15,000
Eastern	58,300	65,200	.....	63,550
Florida	100	200	.....	100
Illinois	202,700	215,000	.....	204,100
Indiana	13,200	13,500	.....	13,500
Kansas	241,500	270,000	255,000	260,250
Kentucky	28,900	28,000	.....	28,950
Louisiana	369,250	365,000	398,733	368,300
North Louisiana	75,600	.....	.....	74,650
South Louisiana	293,650	.....	.....	293,650
Michigan	43,800	47,000	.....	46,300
Mississippi	52,250	48,000	.....	53,150
Montana	22,650	23,200	.....	22,700
Nebraska	750	800	.....	750
New Mexico	101,700	102,000	104,000	101,650
Oklahoma	385,800	390,000	390,000	383,600
Texas	1,894,700	1,990,000	2,016,198	1,894,700
East Texas	316,500	.....	.....	316,500
East Central Texas	128,000	.....	.....	128,000
North Central Texas	147,100	.....	.....	147,100
Texas Panhandle	81,000	.....	.....	81,000
West Texas	457,750	.....	.....	457,750
Southwest Texas	300,100	.....	.....	300,100
Texas Gulf Coast	464,250	.....	.....	464,250
Wyoming	92,400	92,000	.....	91,850
Total United States	4,439,600	.....	.....	4,470,500
Change from previous week	down 30,900			

Total production January 1-December 1, 1945 ..... 1,569,625,625 bbl.
Same period last year ..... 1,531,527,700 bbl.

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EASTERN TEXAS

Humble's Van Zandt Test Pumps 28.65 Bbl.

DALLAS.—Humble Oil & Refining Co. C. W. Bateman, J. Salinga Survey, second producer for the Myrtle Springs field, Van Zandt County, pumped 28.65 bbl. of 39°-gravity oil on a 24-hour official test. Production is from the Travis Peak through perforations from 8,549-63 ft. This is the third test drilled in the field, the second test being dry. Humble 1 E. E. Lutz, Allison Survey, wildcat 2 miles west of Jackson in Van Zandt County, was drilling below 6,106 ft. in shale and lime in the Georgetown section.

American Liberty Oil Co. 1 Houston County Timber Co., A. Henry Survey, Trinity County wildcat 4 miles north of Apple Springs, was drilling below 4,190 ft. Humble 1 W. T. Todd, deep test in the Boggy Creek area, was drilling below 7,809 ft. in shale. Delta Drilling Co. 1 Livingston, Nacogdoches University Survey, Hopkins County wildcat 3 miles southeast of Reilly Springs, was drilling below 7,663 ft. in anhydrite and shale with no shows reported.

Hawkins field, Wood County, has three completions this week and Carthage field, Panola County, two. Hawkin field reported three new locations.

EASTERN TEXAS WILDCAT FAILURES

Cherokee County: Allied Oil 1 Mrs. Rugh Franks, James Dill Sur., 3 mi. NE Alto, elev. 362 ft., Woodbine 5,021 ft., Georgetown 5,380 ft., dry, TD 5,412 ft.

Freestone County: W. C. Curry 1 O. Burleson, James Sparks Sur., 2 mi. SW Streetman, elev. 328 ft., Austin 2,957 ft., dry, TD 3,510 ft.

Harrison County: Stanolind 1 Hattie Cole, Charles Taylor Sur., 9 mi. S Marshall, elev. 318 ft., James 5,945 ft., Pettit 6,235 ft., Travis Peak 6,625 ft., dry, TD 6,800 ft.

Marion County: Texzona Prod. 1 Turner-Hickey, Robert Potter Sur., dry, TD 2,861 ft.

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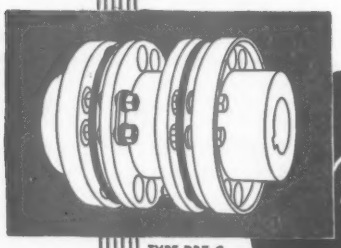

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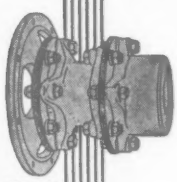

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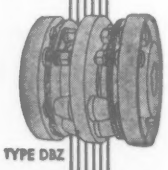

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CALIFORNIA

Four Los Angeles Basin Wildcats Show Promise

LOS ANGELES.—California now has four wildcats that show promise, despite unfavorable factors. These are Standard Oil Co. of California's Leffingwell project, Richfield Oil Corp.'s Bandini wildcat, Ohio Oil Co.'s Gardena test, and General Petroleum Corp.'s La Mirada wildcat, the latest to enter the promising stage.

General Petroleum's wildcat made a short flow test a few days ago and showed a daily rate of 650 bbl. cutting 40 per cent from an interval at 12,042-200 ft. This wildcat kicked over without a single run of the swab indicating a bottom-hole pressure of about 5,000 lb. but died several hours later. The field department has gone back into the hole with a swab and the next few days should determine what the well will do.

Richfield is testing and cementing its Bandini wildcat which, except for water, looked rather good a week or so ago. It has not yet been determined whether this water is formation water or coming from behind the casing. There is enough oil sand to make a good flowing well and the unfavorable nature is a high water cut.

Standard of California, which expected to complete its Leffingwell wildcat several weeks ago only to find the sand lacked enough oil and gas to produce, has found another oil sand body at 11,448-567 ft. with the bit still in the possible pay when the core was taken. Coring is continuing.

Ohio Oil is still working on its Gardena wildcat which has made several flows only to have water break in. It is improbable that the company will be able to entirely exclude the water but it might be able to salvage several thousand feet of hole by whipstocking. Bottom is at 10,594 ft.

All four of the above-named wildcats are located in Los Angeles Basin, but the San Joaquin Valley also has an interesting deep test under way. This is Standard's deep test in the Kettleman Middle Dome which has found some good-looking oil sand in the Tembler at 9,200 ft. This well was started down as a test of the Eocene but will probably test everything that looks good on the way down.

Long Beach Oil Development Co. has made a discovery that may prove of importance in the Wilmington field by completing 109-W in what has been classified as a conglomerate at 5,970 ft. flowing 1,440 bbl. daily. This is the first time a conglomerate has been reported at Wilmington although a number of wells have gone down to the schist basement.

New locations reported this week were slightly above the number of completions.

CALIFORNIA WILDCAT FAILURES

Kern County, Belridge: U. S. Drilling Co. 2 Morris, 14-28s-20e, bottomed in gray sand, cored 7 ft. of oil sand at 970-990 ft., cored 18-in. oil sand at 995-1,010 ft., no tests made, insufficient oil sand, TD 1,196 ft.

Solano County, Rio Vista: Honolulu and Barnsdall 2 Liberty Farms, 12-5n-2e, bottomed in gray sand, all sands were gray and barren, TD 5,527 ft.

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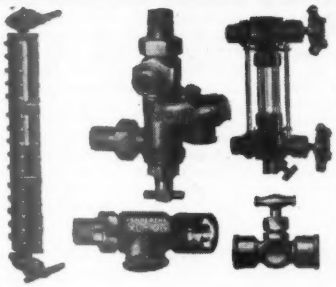

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PERMIAN BASIN

New Devonian Area Opened in Andrews

MIDLAND.—A new Devonian area has been opened by Mid-Continent Petroleum Corp. approximately 2 miles south of the Fullerton field in Andrews County at its 1-15 University. A dry hole, Frank and George Frankel 1-I University separates the test from the Fullerton 8,500-ft. pool. Casing was perforated with 239 shots at 8,590-8,650 ft. After circulating, the well kicked off and flowed 100 bbl. of oil the first hour and 100 bbl. the second, 0.8 per cent drilling fluid. The flow was through a ¾-in. choke. The well is located in Section 42, Block 13, University Lands. Official test will be taken.

Fullerton Oil Co. 322-A (formerly 9-A) Wilson, Section 16, Block A-32, Public School Land Survey, which promises Ellenburger production for the Fullerton pool, ran a 155-minute drill-stem test from 9,820-946 ft. It flowed mud in 18 minutes, oil in 35 minutes. In the first 30 minutes it flowed 23 bbl. of fluid, the second 30 minutes 17 bbl., the third 30 minutes 3 bbl. and then died. When testing tool was pulled, it was found plugged with cuttings and operator will acidize the pay section. Sinclair Prairie Oil Co. 1 George F. Ratliff, Section 25, Block 73, Public School Land Survey, 5 miles southeast of the Bedford pool, ran a 132-minute drill-stem test from 10,930-995 ft. Recovery was 90 ft. of drilling mud and 3,364 ft. of sulfur water. The test is scheduled to be abandoned, having failed to show in any horizon.

Coates & Foster 1 C. H. Cole, Section 49, Block M, EL&RR Survey, in the Welch field, is the first continuously flowing producer to be completed in Dawson County. The well flowed 96 bbl. of pipe-line oil in 24 hours through a ½-in. tubing choke. Humble Oil & Refining Co. plans to drill an 8,500-ft. wildcat to explore the Ellenburger in Kent County. It is 1 Lida Vick, 660 ft. from the north and 1,980 ft. from the east line of Section 45, Block 5, H&NG Survey. The test is 20 miles north of Snyder.

Cities Service Oil Co. 1 J. E. Parker, Section 20, Block 40, T-2-S, T&P Survey, proposed Ellenburger wildcat on the west side of the Harper field in Ector County, had a slight oil staining in the Clear Fork from 6,360-70 ft. On a 127-minute drill-stem test from 6,358-6,450 ft., 60 ft. of drilling mud, 90 ft. of drilling mud cut with sulfur water, and 210 ft. of sulfur water was recovered. There were no shows of oil or gas. It was drilling below 6,812 ft. in lime. Skelly Oil Co. 1 C. C. Colden, Section 80, Block 10, H&GN Survey, wildcat between the Abell and Apco-Warner pools of Pecos County, cored from 6,300-15 ft. and recovered 3 ft. of hard dolomite with slight oil stains. On a 1-hour drill-stem test from 6,279-6,315 ft., 30 ft. of drilling mud with no shows was recovered. Operator was drilling ahead.

TXL field, Ector County, had eight

(Continued on page 144)

CANADIAN FIELDS

North-Central Turner Valley Has New Oiler

CHATHAM. — In North-Central Turner Valley, Royalite Oil 84, LSD 15, 2-20-3w5, with Madison lime at 7,426-7,661 ft., had initial production of 234 bbl. Okalta Oil 22, LSD 8, 1-20-3w5, total depth 4,508 ft., is testing light crude showings in the McDougall-Segur sand. This well

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Persons interested in obtaining full information about these properties, and in negotiating for their purchase or lease, should communicate with the local RFC disposal agency listed below. All data contained herein are necessarily abbreviated and subject to correction. They are not intended for use as a basis for negotiation. RFC reserves the right to reject any or all proposals or offers received for the above properties.

Reconstruction Finance Corporation

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142-T

was drilled to test the shallow oil horizons, disregarded since production in the Madison was developed.

Brazeau.—In the Central foothills, Home-Brazeau Syndicate 1, LSD 5, 17-43-17w5, which got Madison contact at 9,498 ft., is below 9,573 ft. after setting 7-in. casing and has encountered some porosity in the lime.

Hay Lake.—On the Hay Lake Dome, just north of the Montana boundary, Admiral-British Dominion 2, LSD 10, 22-1-17w4, total depth 3,078 ft., is acidizing and testing the top of the Madison limestone.

Jumping Pound.—On the Jumping Pound structure northwest of Turner Valley, Shell 10-14-J, LSD 10, 14-25-5w5, with Madison contact at 10,638 ft., is deepening in the lime below 10,934 ft. after encountering salt water in the first porous horizon at 10,861 ft.

Lethbridge.—With Imperial-Lethbridge 1, LSD 15, 35-7-22w4, close to Madison limestone at 3,633 ft., Imperial-Lethbridge 2 has been spotted 3 miles south in LSD 3, 10-8-22w4. Production is expected in the Madison limestone around 4,100 ft.

ALBERTA WILDCAT FAILURES

Conrad: California-Standard Conrad-Province 73-33-B, LSD 5, 33-5-15w4, TD 3,128 ft., dry.

Grassy Lake: Imperial-Grassy Lake 3, LSD 3, 35-10-13w4, TD 6,400 ft. in Devonian, dry.

Burdett: California - Standard Burdett-Province 2, LSD 1, 10-8-11w4, TD 3,210 ft., dry.

Steveville - Princess: Homestead-New Ranchmen's 1, LSD 15, 36-21-14w4, TD 3,375 ft., dry.

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MICHIGAN

Arenac County Retains Lead in Activity

SAGINAW.—Arenac County's scatter pattern continues to hold good with three of the six completions there in the past week being big wells while three were dry holes; the county retained its rating as most active in the state as a total of 16 tests was completed and 10 new locations announced.

Completions in Sections 9 and 15 of Deep River Township came in for 187 and 300 bbl. per hour, respectively, and in Section 11 of Adams the third rated 40 bbl. per hour. Dry holes were reported in sections 2, 14, and 28, the latter a Michigan Oil Co. wildcat test.

Five of the week's nine dry holes were wildcats. Two additional producers were completed in Bay County and one wildcat test in Ottawa County was developed as a small gas well.

The state oil advisory board reported pressure decline in the Deep River field is slowing up. The baord said decline now is 11½ lb. per day, whereas it was 28 lb. during the summer months. The field is producing better than 4,000 bbl. a day under proration.

Stating the plan is to eliminate confusion, the board recommended to P. J. Hoffmaster, supervisor of wells, a plan to permit the discovery well to establish a drilling pattern as new fields are developed. The plan would provide for hearings in event later developments indicated change advisable in the original pattern.

Three of the new locations in permits issued by the state conservation department are for gas tests in Mecosta County, the others for oil tests, two each in Allegan and Kent counties, one each in Barry, Ottawa, and Newaygo.

MICHIGAN WILDCAT COMPLETIONS

Arenac County, Deep River Township: Michigan Oil Co. 1 Steve Szostak, NE SW SW 28-19n-4e, dry in Dundee formation, TD 2,913 ft.

Kent County, Algoma Township: J. W. Lang Co. 1 Eliza Meek, NW SW SW 19-9n-11w, dry in Traverse limestone, TD 2,257 ft.

Livingston County, Genoa Township: Panhandle Eastern Pipeline Co. 1 G. E. and M. Bauer, C W½ NW NW 25-2n-5e, dry in Clinton formation, TD 4,214 ft.

Mecosta County, Big Rapids Township: Taggart Bros. Gas Co. 2 State-Big Rapids, C S½ 32-15n-10w, gas test, dry, TD 1,346 ft.

Newaygo County, Sherman Township: Sohio Petroleum Co. 1 Spyros K. Vorres, SW NE NE 6-13n-13w, dry in Monroe, TD 3,108 ft.

Ottawa County, Jamestown Township: Clawson Development Co. 1 R. A. and H. Van Bronkhorst, SW NE SW 29-5n-13w, gas producer, 800,000 cu. ft. daily, TD 1,645 ft., plugged back to 940 ft.

MISSISSIPPI

752-Bbl. Oiler Being Completed in Cranfied

JACKSON.—The Cranfield field of Adams County is getting its largest oil well in the completion of Gulf Refining Co. 2 Lees, 75 ft. north and 462 ft. west of SE corner of 69-7n-1w. The well is flowing at the rate of 752 bbl. of 38.3-gravity oil per day from the Massive sand with packer set at 10,300 ft. The Massive was cut at 10,234 ft., and tubing was run to 10,341 ft.

Five field and two wildcat locations have been announced this week. The wildcats will be drilled one in Madison County and one in Marion County. Cranfield and Eucutta each have two new starts and one location has been made in the Gwinville field.

MISSISSIPPI WILDCAT FAILURE

Hinds County: Carter 1 Simmons C-134, 660 ft. south and 800 ft. east of NW corner of SE NW 29-4n-3w, dry, TD 9,056 ft., Comanche 9,043 ft.

ALABAMA WILDCAT FAILURES

Clarke County: Danciger Oil & Refining 1 State of Alabama, 500 ft. north and 666 ft. west of center of 21-5n-2e, dry, TD 4,507 ft., Comanche 3,698 ft.

Mobile County: True Cauble et al 1 Boykin, 725 ft. south and 165 ft. east of NW corner of NE SE 25-2n-1e, dry, TD 7,502 ft., Selma 7,387 ft.

KANSAS

Sedgwick County Test Producing From Burgess

BEECH AIRCRAFT CO. is opening at least one pool for Sedgwick County, and has a show of free oil in another wildcat. Beech Aircraft 1 McLean, NW SE NW 1-27-1e, 1 mile northwest of Wichita, is estimated good for 75 bbl. of oil per day from the Burgess sand. Production is coming from perforations at 2,975-77 ft., and the total depth is 2,979 ft. One mile east of this well, Beech Aircraft 1 Hinkle has had a show of free oil in the Mississippi, and is now drilling below 3,200 ft.

Harper County.—Lion Oil Co. 1 Leeper, NW SE NE 15-31-8w, 20 miles east of the Whelan pool of Barber County, may make a small Mississippi lime producer. Five-inch pipe was set at 4,381 ft., in the top of the Mississippi, and after drilling to 4,385 ft., operators are bailing about 1½ bbl. of oil per hour with no water showing.

Sumner County.—Summit Drilling Co. et al 1 Bellman, NE NE SW 15-30-1e, which was abandoned with a hole full of water some time ago, has been reopened. After squeezing and reperforating, operators are swabbing 348 bbl. of oil per day. Production is coming from the Mississippi lime at 3,797-3,813 ft., and pumping unit is being set for taking potential.

E. H. Adair and Kanotex Refining Co. 1 Gardnier, NE NE SW 3-33-2e, 3 miles south of the Oxford pool, has logged three shows of free oil in the Layton and lower Kansas City zones. Drilling is continuing below 2,335 ft.

KANSAS SUCCESSFUL WILDCATS

Cowley County: New oil pool—Kanotex 1 Tuttle, NW SW NE 7-34-3e, flowed 8 bbl. from Bartlesville at 3,379-3,404 ft., TD 3,404 ft., Mississippi 3,400 ft.

Ellis County: New oil pool, Nicholson—Phil Han 1 Nicholson, SE SE NW 30-11-20w, physical potential 446 bbl.

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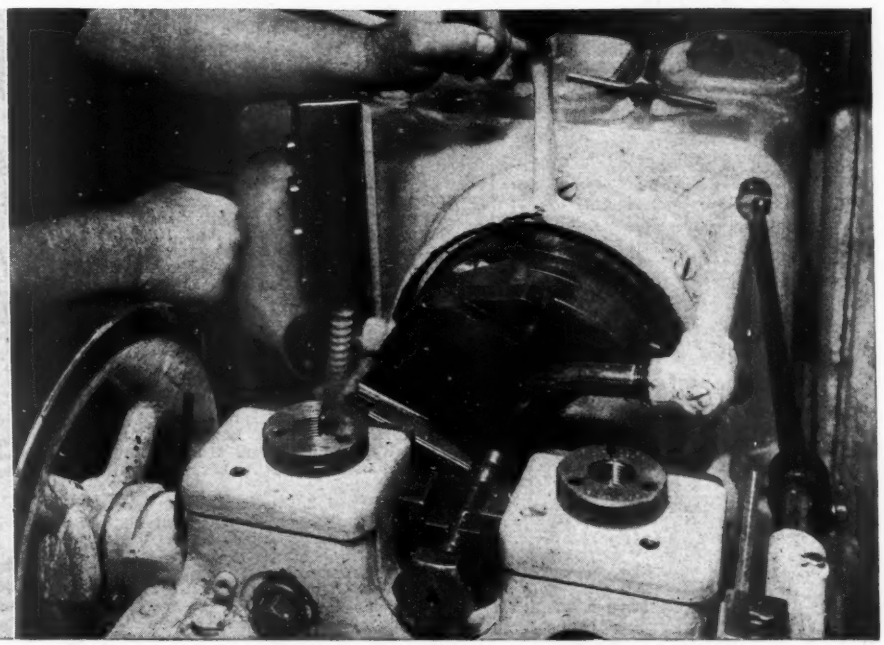

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of 35-gravity oil from Arbuckle at 3,844-55 ft., TD 3,855 ft., Kansas City 3,542 ft., Arbuckle 3,842 ft.

Rush County: New gas field—Eldorado Refining 1 Urban, NW NE NW 21-16-17w, 1,300,000 cu. ft. gas from Arbuckle at 3,523-37 ft., TD 3,548 ft., Arbuckle 3,521 ft.

KANSAS WILDCAT FAILURES

Barton County: Raymond Gear et al 1 Dietz, NE NE NE 9-17-14w, dry, TD 3,458 ft., Arbuckle 3,449 ft.

Edwards County: Continental 1 Krupp, SE NW NE 21-23-19w, dry, TD 5,028 ft., Arbuckle 4,998 ft.

Ellis County: Cities Service 1 Brungart, SE NE SE 30-14-16w, dry, TD 3,490 ft., Arbuckle 3,454 ft.

Cinoil 2 Behrens, SW SW NW 1-14-16w, dry, TD 3,492 ft., Arbuckle 3,480 ft.

Marion County: Alpine Oil & Royalty 1 Baxter, NE NW SW 30-19-4e, dry, TD 2,595 ft., Viola 2,574 ft.

Pawnee County: Skelly 1 Hall, SW NE NE 30-23-15w, dry, TD 4,171 ft., Arbuckle 4,157 ft.

Sedgwick County: Pickerell & Lindas 1 Mayall, NW NW SW 11-25-1e, dry, TD 3,656 ft., Arbuckle 3,641 ft.

N. CENTRAL TEXAS

Clay County Wildcat Shows 1,450 Ft. Oil

WICHITA FALLS.—Continental Oil Co. 1-C Heard, Block 3222, TE&L Survey, southern Clay County wildcat 3 miles southeast of the Joy pool, took a 60-minute drill-stem test from 6,740-80 ft. in the Caddo. There was a show of gas and 1,450 ft. of oil and 350 ft. of oil-cut mud and no water was recovered. It was drilling below 6,002 ft. in shale. Fred M. Manning, Inc. 1 C. L. Adkins, Block 961, TE&L Survey, wildcat 6 miles north and slightly west of Woodson, Throckmorton County, drilled saturated lime at 3,905 ft. in the Caddo. On a 40-minute drill-stem test of the section oil flowed in 15 minutes. Operator was setting 7-in. casing and waiting on cement to set.

National Associated Petroleum Co. 1 Alexander, A. Buffington Survey, Montague County wildcat 2 miles south of Nocona, ran a 1-hour drill-stem test from 5,870-84 ft. and recovered 120 ft. of oil and gas-cut mud. It was drilling below 5,937 ft. in sandy lime. Continental 1 J. E. Cox, Section 32, Block 1, Henderson County School Land Survey, wildcat 2 miles north of Gibtown, Jack County, drilled lime showing oil at 6,215-36 ft. and was drilling deeper.

Electra field, Wichita County, had 14 field completions this week and K.M.A. and Burk fields, Wichita County, each had 3. Archer County reported seven new field locations and Cooke and Wichita counties four each.

NORTH CENTRAL TEXAS WILDCAT FAILURES

Archer County: Benson Brothers 1 Turberville, Blk. 169, J. W. Cain Sur. A-69, 6 mi. W and 2 mi. N Archer City, dry, TD 1,492 ft.

C & N Drilling 1 C. J. Long, Blk. 94, J. W. Harris Subd., 1 mi. S and 5 mi. W Archer City, elev. 1,056 ft., dry, TD 1,383 ft.

Frank M. Wood 2 Vernon Brown, Sec. 2, SPRR Sur. A-921, 6 mi. S and 1½ mi. W Archer City, dry, TD 1,601 ft.

Cooke County: S. D. Johnson et al 1 D. E. and E. M. Gross, Jno. Guffey Sur. A-1545, 2 mi. E and 1 mi. N Rosston, dry, TD 2,955 ft.

R. C. Lipscomb 2 J. G. Cannon, Jno. E. Johns Sur. A-1569, 2½ mi. S and ½ mi. W Bulcher, dry, TD 1,447 ft.

Jack County: Helmerich & Payne 1 Palm-

(Continued on page 144)

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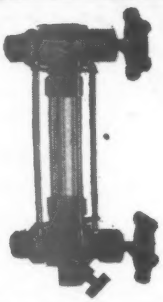

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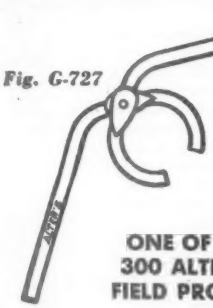

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APPALACHIAN FIELD

Good Gas Well Completed in Elk-Poca

PITTSBURGH.—In Elk district, Kanawha County, West Virginia, Columbian Carbon Co. completed another good gas well in the new Oriskany extension of the Elk-Poca field with 817 John R. Cork gaging 5,034,000 cu. ft. after shot. The Corniferous lime was topped at 5,038 ft., Oriskany at 5,159 ft., gas at 5,170-81 ft., shot at 5,169-94 ft., rock pressure 1,220 lb. in 1 hour, total depth 5,242 ft.

In Wyoming County, Hope Natural Gas Co. completed a good Berea well in 8,955 New River and Pocahontas Coal Co. in Baileysville district, which gaged 4,355,000 cu. ft. of gas with the Ravencliff sand at 1,500-42 ft., about 146,000 cu. ft. of gas at 1,533-35 and 1,538-40 ft., Maxton sand at 2,313 ft., Big lime at 2,580-3,000 ft., Berea at 3,655 ft., gas at 3,675-89 ft., rock pressure 735 lb. in 1 hour, total depth 3,695 ft.

In Slab Fork district, Wyoming County, Godfrey L. Cabot, Inc. failed of production in 1,173 Pocahontas Land Corp. with the Maxton sand at 2,331 ft., Big lime at 2,890-3,335 ft., Injun at 3,335-74 ft., show of gas at 3,115 ft., acidized with no result, total depth 4,110 ft.

In Tucker County, Ohio Oil Co. has so far been unable to reach the Oriskany sand again in the wildcat on Kuykendall Unit in Dry Fork district, after setting whipstocks above the tools lost in the Oriskany. Another whipstock is being set and another attempt will be made to bypass the tools.

During the week, 16 new locations were announced of which 2 will be Oriskany tests near recent large wells in Jackson

(Continued on page 144)

OHIO, KENTUCKY

Middle Wellington Pool Gets Good Completion

COLUMBUS.—The Middle Wellington pool in Lorain County had another good completion this week. Ohio Fuel Gas Co. 1 H. L. Ferriman, Lot 3, Penfield Township, made 6,420,000 cu. ft. in the upper Clinton at 2,393-408 ft. Two additional locations to the north have been staked.

In the northeast part of the Columbiana County Oriskany pool, Ohio Oil Co. 1 L. C. Stanley, Section 1, Knox Township, came in at 1,571,000 cu. ft. natural and was shut in on the casing 4 hours after shot at 3,749,000 cu. ft.

North of the Clayton field in Madison Township, Perry County, Atha 1 J. A. Barr, Section 16, gaged 944,000 cu. ft. natural with 1,000 lb. rock from the Clinton at 3,287-315 ft. The company has staked a west offset. In Reading Township, Perry County, Twenty Grand 2 Walter Garey, Section 10, made 140 bbl. in 24 hours Clinton sand was found at 3,020-60 ft.

Locations for the week were off sharply to nine with Lancaster and Ashland fields each having 3. Completions were also off to a total of 16, with Cambridge and Ashland fields each having 5.

WILDCAT FAILURES COMPLETED IN OHIO

Washington County, Decatur Township: Ohio Fuel 1 Azel Reed, Fr. 1, Berea 1,808-11 ft., TD 1,895 ft.

WESTERN KENTUCKY

OWENSBORO.—Henderson County had a new oil pool last week with the completion of Basin Drilling Co.'s 1 Kasey Club, 8-P-23. This well made 220 bbl. of oil in 20 hours pumping on beam. Drilled to a total depth of 2,461 ft., the well is producing from the McClosky lime at 2,440-48 ft. The 1 Kasey Club is approximately 2 miles south of Henderson, and about 5 miles from other oil producers.

WESTERN KENTUCKY WILDCAT FAILURE

Webster County: Iley B. Browning 1 Sallie V. Jenkins, SW SE NE 2-M-23, elevation 602 ft., dry at 1,852 ft.

EASTERN KENTUCKY

ASHLAND.—Pike and Floyd counties came in for completion notes in the eastern Kentucky field of operations during the week. Kentucky-West Virginia Gas Co. completed No. 788 on the Sophronia Bartley property in Pike County, total depth of 3,479 ft., open flow 215,000 cu. ft. in shale, after shot. Kentucky-West Virginia Gas also completed No. 5,602 on the Harvey Johnson property in Floyd County, total depth 3,445 ft., open flow 245,000 cu. ft. in shale, after shot.

INDIANA

EVANSVILLE.—Four wells were completed in Indiana during the past week. Two of these were dry while the others were small oil producers averaging 14 bbl. of oil per day initially.

Gibson County's newest prospect, the Ryan Oil Co. 1 N. H. Kern, SE SW SW 23-1s-12w, at a total depth of 1,980 ft., swabbed at the rate of 150 bbl. of oil daily after a 61-qt. shot in the Cypress sand. The well is now on pump and testing the Cypress sand which was found at 1,965-80 ft. Ryan Oil Co. 2 N. H. Kern, SW SW SW 23-1s-12w, a west offset to the discovery, is drilling at 1,906 ft.

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ROCKY MOUNTAIN

Oil Sand Encountered in Cambrian in Oregon Basin

DENVER.—A saturated oil sand in the Cambrian formation, the first to be discovered in that horizon in the Rocky Mountain area, was encountered this week on the south dome of the Oregon Basin field, Park County, Wyoming, in Pacific Western Oil Corp. 1 Unit 5 (Connaghan) SW SW SE 29-51n-100w, joint with Kirk Oil Co. The sand was topped at 6,290 ft. and continued to 6,385 ft., of which approximately 80 ft. showed light green oil saturations. A drill-stem test was attempted at 6,340-90 ft., but was a failure on account of the condition of the hole. Several cavities causing loss of circulation had been encountered in upper formation. The 5½-in. casing will be run and a test made, but before that is done the hole may be carried into the granite for geological determinations. The identity of the sand, other than that it is in the middle or lower Cambrian, has not yet been definitely determined, and may be the Reagan, in the lower section, or the Flathead, in the middle section. Water was encountered in the top of the Deadwood and below that horizon considerable red shale was cored.

Muddy at River Dome.—Pure Oil Co. 1 Unit, NE NE NW 18-48n-92w, Washakie County, Wyoming, River Dome, topped the Muddy sand in the Cretaceous formation at 8,117 ft., and a drill-stem test at 8,250 ft. indicated 5,000,000 cu. ft. of gas and 200 bbl. of condensate per day. Sands in the Frontier showing gas and distillates were cased off with the 9⅝-in. at 7,596 ft. The structure, which is out in the Big Horn basin, around the rim of which are numerous black oil fields, is the first in the Rocky Mountain area to find a structural high in lower beds after drilling through a Tertiary structure worked out by geophysical methods. There is no surface geology. The test is continuing to the objective Embar-Tensleep sands and a second well a mile to the north is spudding to test the upper horizons.

Cat Creek discovery extended.—Dave Schrock 4 Fifer, NE NE NE 20-15n-30e, Cat Creek field, Montana, topped the Ellis at 1,397 ft. and drilled 20 ft. of sand to 1,417 ft., total depth, when it started flowing at the rate of 250 bbl. per day. It is a west offset to the Ellis sand dis-

(Continued on page 144)

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ILLINOIS

New Fields Opened in Clay And Jasper Counties

MATTOON.—Two new oil fields were opened in Illinois during the past week. The first of these was in Jasper County, where Shulman Bros. 1 Bunton. W½ NW NE 31-7n-10e, was completed on pump for 37 bbl. of oil and 30 bbl. of water daily after an acid treatment of 5,000 gal. in the McClosky at 2,857-63 ft., total depth. The 1 Bunton is about 4 miles west of production in the Willow Hill field.

In Clay County, Paul Doran 2 Brissenden, NE SE SW 16-3n-7e, was completed on pump in the Tar Springs sand at 2,314-20 ft., total depth, for 170 bbl. oil and 1 bbl. water daily. The well is about 1½ miles south of the Sailor Springs field and will either extend that field or open a new oil producing area.

Clay County also supplied the best well of the week in the Kingwood 2 A. Faulk. The 2 Faulk, NW SW SW 13-5n-7e, in the West Ingraham field, flowed 1,023 bbl. of oil in 24 hours after a 5,000-gal. acid treatment in the McClosky at 2,832-42 ft. Casing was perforated at 2,826-28 ft. and 2,833-43 ft. Perforations were also made opposite a show of oil found at 2,865-69 ft.

ILLINOIS SUCCESSFUL WILDCATS

Clay County: Paul Doran 2 Brissenden. NE SE SW 16-3n-7e, pumped 170 bbl. oil and 1 bbl. water, Tar Springs sand 2,314-20 ft., TD 2,320 ft.

Jasper County: Shulman Bros. 1 Bunton. W½ NW NE 31-7n-10e, pumped 37 bbl. oil and 30 bbl. water, 5,000 gal. acid. McClosky 2,857-63 ft., TD 2,863 ft.

ILLINOIS WILDCAT FAILURES

Coles County: A. Y. Bradley et al 1 P. Cramer, SE SE SE 35-13n-7e, dry at 2,026 ft., Glen Dean 1,653 ft., Barlow 1,750 ft., Cypress sand 1,811-31 ft., Renault 1,875 ft., Ste. Genevieve 1,957 ft., Rosiclare 1,986 ft., Fredonia 2,010 ft.

Jefferson County: McFarland 1 Bates, NW NW NW 8-1s-1e, dry at 1,925 ft., Glen Dean 1,686 ft., Cypress 1,881 ft., Cypress sand 1,892 ft.

Washington County: Ryan Oil Co. 1 Pairot, SE NW NW 14-2s-2w, dry at 1,901 ft., Glen Dean 1,224 ft., Paint Creek 1,532-48 ft., Aux Vases sand 1,628-1,700 ft., Ste. Genevieve 1,700 ft., Lower O'Hara 1,712-28 ft.

Wayne County: Central Pipe Line 1 A. Metcalf, SW NE NE 5-2s-9e, dry at 3,412 ft., Waltersburg sand 2,530 ft., Tar Springs sand 2,631 ft., Cypress sand 2,930 ft., Benoist 3,106 ft., Benoist sand 3,126 ft., Ste. Genevieve 3,282 ft., Rosiclare 3,299 ft., McClosky 3,328 ft.

White County: Ryan Oil Co. 1 Higgin-

son Heirs, NE NW NE 22-4s-10e, dry at 1,879 ft.

LA.-ARK.

Champagnolle Area Extended Eastward

MAGNOLIA. — The Champagnolle area may be extended eastward, and add a new producing zone if successful completion is made of Atlantic Refining Co. et al 1 Goode, NW 6-17s-13w. H. L. Hunt is taking over to test the Smackover lime, cut at 5,643 ft. A drill-stem test at 5,649-57 ft. recovered 125 ft. of oil and 1,150 ft. of salt water.

Six wells were completed in Arkansas this week, including four oil wells, and two dry holes, one of which was a Calhoun County wildcat. The Stephens field took the lead with two new producers completed.

In the North Louisiana fields, 12 wells were completed, with 6 oilers, 1 gas well, and 5 dry holes, two of which were wildcat tries. The Big Creek field of Richland Parish added four new producers with a combined initial of 2,176 bbl. per day.

Sixteen new locations were announced for North Louisiana this week, all field tries. The Big Creek-Delhi area of Richland Parish is undergoing an intensive drilling campaign, and 10 of the locations are in that area. No new locations were announced this week for the Arkansas fields.

NORTH LOUISIANA WILDCAT FAILURES

Caddo Parish: Sohio and Continental 1 Etheridge, 990 ft. north and 4,290 ft. east of SW corner of Section 14 in Section 3-14n-12e, dry, TD 8,024 ft.

West Carroll Parish: California 1 Hill, 534 ft. north and 635 ft. east of SW corner of 2-19n-9e, dry, TD 7,337 ft.

ARKANSAS WILDCAT FAILURE

Calhoun County: Cressien and R. H. Crow, trustee, 1 Nettles, NE SW NE 3-15s-14w, dry, TD 2,550 ft.

OKLAHOMA

Misener Zone Productive In Steedman District

SUNRAY OIL CORP. has established commercial oil production from the Misener sand in the Steedham pool of Pontotoc County with its 1 Busby, NW SE NW 1-4n-7e. The Misener discovery was drilled to a total depth of 4,500 ft. in the Wilcox sand and casing was set on bottom. The Misener sand was drilled from 3,794-3,835 ft., but the only perforations made were opposite a 6-ft. section at 3,799-3,805 ft. The well swabbed 10 bbl. of oil per hour during tests and is now shut down while operators are installing pump.

Meanwhile, Carter Oil Co. continued to drill ahead at its McClain County discovery, 1 Mottinger, NW NW 5-6n-3w. The well was still in the productive Bromide zone at 10,932 ft. with samples showing oil at that depth. To date, approximately 100 ft. of the Bromide section have been drilled and, although all of it is not commercially productive, no salt water has yet been encountered. Latest drill-stem test, taken at 10,902-22 ft., was of 2 hours and 40 minutes duration with a 500-ft. water load. The test showed gas in 20 minutes which blew steadily throughout. In addition to the 500-ft. water load, 700 ft. of oil was discovered with no salt water showing. The pool opened by this well has been named the Iron Chapel pool and its development will be furthered immediately. Carter Oil Co. has already staked location for 1 Mary Mottinger, NW SW 5-6n-3w, ½ mile southeast of the discovery.

Deep Rock Oil Corp.'s Wilcox sand discovery in Noble County, 1 White, SW NE NE 19-23n-2w, is waiting on cement to set with 7-in. casing landed at 4,433 ft. Total depth is 4,450 ft.

Interest is again increasing in the South and West Marlow areas of Stephens County as the result of findings at Texas Co.'s 1 Blake, SW NW SE 21-2n-8w, in the West Marlow pool. On a drill-stem test with packer set at 6,684 ft. and with tool open for 45 minutes, gas showed in 11 minutes, estimated at 200,000 cu. ft., and when the tool was pulled, it held 360 ft. of high-gravity oil and 270 ft. of oily mud.

OKLAHOMA WILDCAT FAILURES

Creek County: Deep Rock and Zephyr 1 Cities Service, SW SW NE 33-19n-8e, dry, TD 3,087 ft., May 3,048 ft.

Ross & McKenzie 1 Anthis, NE SW SW 8-16n-7e, dry, TD 1,578 ft., Layton 1,565 ft.

Grady County: Big Chief and Mid-Continent 1 Beeler, SE SW SW 11-6n-7w, dry, TD 7,665 ft., Hoxbar 6,097 ft.

Lincoln County: Four States 1 Watson, SE SE NE 13-15n-4e, dry, TD 3,650 ft., Prue 3,560 ft.

McClain County: Carter et al 1 Hawkins, NE NE 34-6n-3w, dry, TD 9,244 ft., Bromide dense 9,072 ft.

Marshall County: Allied et al 1 State School Land, SW SW NE 1-5s-4e, dry, TD 3,186 ft., in Bromide.

Noble County: J. R. Porter 1 Mayberry, NW SE SE 17-21n-2w, dry, TD 5,341 ft., second Wilcox 5,303 ft.

Seminole County: Kubat et al 1 Deer, NE NE NE 27-10n-8e, dry, TD 4,158 ft., Hunton 4,145 ft.

Stephens County: Jones & Hammer 1 Lester, NW SW NE 8-1s-8w, dry, TD 2,686 ft.

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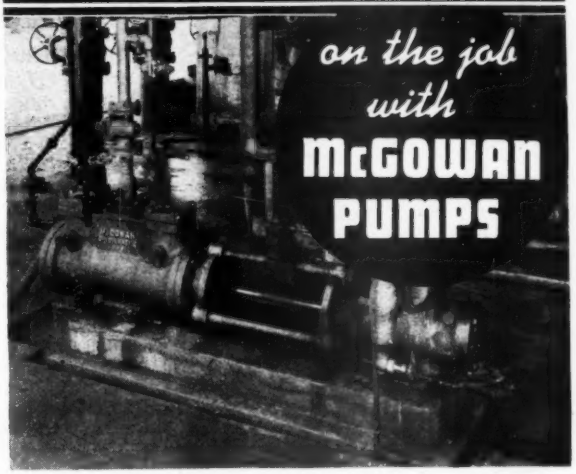

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Among the

Drilling Contractors

Rulin Overleese, Rushville, Ind., is the contractor for J. Harvey Snider et al 1 Sizemore, 6 ft. from the north line and 900 ft. from the east line of NE NE 15-19n-11e, in Fayette County, Indiana.

Goll, Graves and Mechling will drill Basin Oil Co. and Don Rayburn A-1 State-Deep River, SE SE SW 6-19n-4e, in the Deep River pool of Arenac County, Michigan.

Newell & Chandler, Calgary, have the contract for Phillips Petroleum 2, on the Sullivan Creek structure west of South Turner Valley. Location, in 22-18-5w5, is 15 miles west of Turner Valley.

Fenpar Drilling Co. is the contractor for Ohio Oil Co. 1 Mio unit area, SE NW SW 30-25n-3e, a wildcat in Oscoda County, Michigan.

E. F. Moran is the contractor for Carter Oil Co. 12 Culver heirs, 24-P-21, in the North Waverly field of Union County, Kentucky.

H. L. Behm, Celina, Ohio, is the contractor for two tests in Decatur County, Indiana. They are Indiana Gas & Water Co., Inc. 252 Alexander, SE SE SE 12-9n-9e, and Indiana Gas & Water 258 Hornberger, NW NW NE 15-9n-9e.

George & Wrather, Mt. Carmel, Ill., will drill the B. A. Baker 1 Fritschle, NE NW NW 25-3n-10e, in Richland County, Illinois.

Harry H. Fox, Shelbyville, Ind., has the contract for three tests in Decatur County, Indiana. Indiana Gas & Water Co., Inc. is the operator, and the tests are 253 Tichener, NE NE NW 22-9n-9e; 254 Tichener, NW NW NW 22-9n-9e, and 257 Griffin, SW SW SW 15-9n-9e.

C. B. Miller will drill the P. K. Degenther 1 Starken, NE SW NW 8-6n-13w, a wildcat in Ottawa County, Michigan.

E. F. Moran, Evansville, Ind., is the contractor for Sinclair-Wyoming Oil Co. 9 Elliott, 300 ft. from the south line and 290 ft. from the west line of SW SW 14-5s-14w, in Posey County, Indiana.

Clen Kwis, Portland, Ind., will drill the Portland Oil Co. 3 Vance, 300 ft. from the south line and 1,155 ft. from the east line of SE SW 2-23n-14e, in Jay County, Indiana.

Herschel Phillips is the contractor for Walter A. Elliott 2 Fellows, SW SW SW 22-1s-16w, in the Geneva field of Van Buren County, Michigan.

Sallee Brothers, Evansville, Ind., is rigging up for Sun Oil Co. 6 Pritchett, 21-O-22, in Henderson County, Kentucky.

Fred M. Manning, Inc., is the contractor for a deep test in Morgan County, Colorado. Tide Water Associated Oil Co. will be the operator

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and the test will be drilled in the Orchard area, SW SW SW 30-5n-60w.

Mercury Drilling Co. has the contract for Globe Oil & Refining Co. 1 Affholder, NE NE SE 19-23n-2w, Noble County, Oklahoma, in the new Billings field.

Danciger Oil Co. is rigging up for California Co. 12 Lees, 45-7n-1w, in the Cranfield field of Adams County, Mississippi.

Penrod Drilling Co. has the contract for Gulf Refining Co. 3 Lees, 1,850 ft. north and 1,140 ft. east of SW corner of 32-7n-1e, in Cranfield field, Franklin County, Mississippi.

CALENDAR

December

Independent Natural Gas Association of America, annual membership meeting, Baker Hotel, Dallas, December 10.

Interstate Oil Compact Commission, Wichita, Kans., December 13-15.

1946

January

FPC regional hearing in natural-gas investigation, Court House Building, Houston, January 28.

Independent Natural Gas Association of America, annual membership meeting, Texas State Hotel, Houston, January 28.

February

American Welding Society, national meeting, Hotel Cleveland, Cleveland, February 4-7.

Iron and Steel and Institute of Metals divisions, American Institute of Mining and Metallurgical Engineers, national meeting, Statler Hotel, Cleveland, February 4-8.

American Society for Metals, annual convention (postponed from 1945), Statler Hotel, Cleveland, February 4-8.

FPC regional hearing in natural-gas investigation, Buena Vista Hotel, Biloxi, Miss., February 11.

FPC regional hearing in natural-gas investigation, Chicago, February 19.

American Society for Testing Materials, spring meeting, Pittsburgh, February 25-March 1.

Exposition of Chemical Industries, twentieth exposition, Grand Central Palace, New York, February 25-March 2.

March

FPC regional hearing in natural-gas investigation, Charleston, W. Va., March 19.

Southern Gas Association, annual convention, Galveston, March 21-22.

April

American Association of Petroleum Geologists, annual meeting, Stevens Hotel, Chicago, April 2-4.

Natural Gasoline Association of America, annual convention, Baker Hotel, Dallas, April 17-19.

National Petroleum Association, semi-annual meeting, Hotel Cleveland, Cleveland, Ohio, April 18-19.

May

National Association of Corrosion Engineers, annual meeting, President Hotel, Kansas City, Mo., May 7-9.

June

American Society for Testing Materials, annual meeting, Buffalo, June 24-28.

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For oil field, locomotive type and marine boilers. Water shows black — steam shows white; the water level is unmistakable. U-Bolt construction is strongest and simplest to service. Glass replaced by simply removing nuts on face of gage . . . unnecessary to work between gage and boiler. Conforms with A.S.M.E., Federal and State requirements when used for pressures specified by their respective codes.

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PERSONALS

First One to Finish Apprenticeship Course

ONE of the things in which Walter C. Beckjord, new president of Cincinnati Gas & Electric Co., takes pride is the fact that he was the first person to finish the 2-year apprenticeship course of St. Paul Gas Light Co. That was after he had graduated in 1909 at University of Minnesota with a degree in electrical engineering. He soon was filling a job as construction and electrical engineer. He did electrolysis and valuation work and in 1916 he was transferred to Madison (Wis.) Gas & Electric Co. as general superintendent, covering both gas and electrical divisions. Later that year he was assigned to the New York office of American Light & Traction Co. as assistant engineer.

In 1918 Beckjord went to Harland County, Kentucky, to operate White Star Coal Co., which had been bought by American Light & Traction. In 1922 he became chief engineer of the latter company. Four years later he was made vice president and chief engineer. He was named a director in 1927, serving until 1932.

In January 1930 Beckjord became vice president and general manager of Boston Consolidated Gas Co., resigning in 1934 to join Columbia Gas & Electric Corp. in New York as vice president, general manager, and director, with directorships in the various subsidiaries. In 1938 he was elected president and director of Columbia Engineering Corp.

Christian H. Seger, Jr., formerly credit manager for Bethlehem Supply Co. in Tulsa and later its division sales manager in Houston, was elected a vice president of the National Bank of Tulsa last week. He was manager of the bank's credit department before joining Bethlehem. Seger, who entered naval service in 1942 as a lieutenant (jg), was a lieutenant commander when discharged and for the last 18 months was executive officer at the antiaircraft training center, Oahu, Hawaii.

John E. Mabee, president of Mabee Oil & Gas Co., and **Mrs. Mabee,** will finance construction of two dormitories at University of Tulsa, it was announced last week. The dormitories—Lottie Jane Mabee Hall for Women and John Mabee Hall for Men—will represent a gift of approximately $500,000. Besides large oil holdings Mr. and Mrs. Mabee are joint owners of J. E. Mabee Co., operating extensive ranch and real estate properties. Five years ago Mabee, whose residence is in Midland, Tex., established the Mabee work-aid fund at University of Tulsa to help students working their way through school.

Harold Legatski, Bartlesville, was elected chairman of Oklahoma Chemical Engineering Society at a meeting in Bartlesville November 27. Other officers chosen: Vice chairman, **Harold L. Malakoff,** Barnsdall; secretary-treasurer, **George Hanson,** Bartlesville; members at large on executive committee, **John W. Latchum,** Bartlesville, and **Lawrence Cecil,** Tulsa.

William T. Nightingale, Rock Springs, Wyo., has been appointed general manager of production, transmission, and exploration for Mountain Fuel Supply Co. Nightingale, who received his bachelor of science and master degrees from University of Washington, has been with the company since its organization in 1929 and formerly was in charge of lands and geology. He was made a vice president in 1940 and a director in 1942.

Winston C. Allen, for 3 years with Petroleum Administration for War as an attorney and chief of the development section, production division, has opened a law office in Newark, Ohio.

Woodrow Adams, a captain in the Marine Corps during the war, has rejoined Gulf Oil Corp. in its land and scouting department at Midland, Tex.

Leo L. Sargent, formerly a driller for Shell Oil Co., Inc., has been advanced to drilling foreman in the Oilfields San Joaquin division, California.

James A. Hall, released from Army service, has been made district petroleum engineer in the oil and gas division of the Texas Railroad Commission at Midland. Hall, who graduated from Texas A. & M. College in 1937, was on the commission's engineering staff when he entered the Army in 1940.

Paul J. Howard, for 8 years a petroleum engineer in California's oil and gas division, has opened an office in Bakersfield as a consulting engineer and geologist.

J. J. Zorichak, for 14 years a petroleum engineer for Stanolind Oil & Gas Co. in Tulsa and later on the engineering staff of Petroleum Administration for War in Denver, has been named chairman of an engineering committee to supervise procedure in the Rangely oil field of western Colorado.

Rupert F. Carroll has been promoted to district civil engineer for Humble Oil & Refining Co. in the Willamar district, Raymondville, Tex.; **James E. Ozburn,** to district civil engineer in the London district, Overton, Tex.; **Verne E. Wexley,** to district civil engineer in the Scott & Hopper district, Encino, Tex. **J. M. Spiller,** returning from military service, has been transferred from the North Crowley district, Louisiana, to the East Texas division office, Tyler, as district civil engineer.

Allen F. Hansen, formerly scout for The Pure Oil Co. at Roswell, N. M., is back from 3 years' service in the Army and is scouting for the company in the West Central Texas district, with headquarters in Abilene.

Lt. Col. Robert W. Hird, on military leave from the sales promotion division of Continental Oil Co., has been awarded the Legion of Merit

decoration for outstanding service in developing the famous "Weasel," officially known as Cargo Carrier M29C. Colonel Hird is an engineering graduate of University of Nebraska.

Frank V. Eaton, pioneer oil man in Pennsylvania fields, has sold his interests in the Osage field of Wyoming and plans to select a home somewhere in the South.

F. L. Barr, who was assistant maintenance foreman at Shell Chemical Co.'s plant at Cactus, Calif., has been advanced to engineer.

T. R. Spurling, formerly assistant superintendent of Lone Star Gas Co.'s cycling plant at Grapeland, Tex., has been promoted to superintendent of the Trinidad, Tex., plant. He succeeds **W. A. Robinson,** who was appointed assistant superintendent of the company's gasoline plants in West Texas.

J. A. Sinex, released from war service, has been engaged as production and drilling superintendent for **Lester T. Burns,** independent oil operator of Wichita Falls, Tex. Sinex, formerly a geologist in Wichita Falls, was a Navy flier in the Southwest Pacific campaigns, received a lieutenant's commission, and saw action at Leyte, Iwo Jima, and Okinawa.

Albert W. Watt, for 41 years with Standard Vacuum Oil Co., who left retirement to aid the war effort, and **Claggett H. Pattie,** with Shell Oil Co., Inc., at New Orleans for 17 years, have been awarded the Meritorious Civilian Emblem by the War Department. Both served the fuels and lubricants division, Office of the Quartermaster General, in its mission of procuring gasoline and oil for the Army.

Maj. Paul E. Taliaferro, for 3½ years in the judge advocate section of the Army Air Forces, has returned to his former post as vice president of Sunray Oil Corp., Tulsa, in charge of the legal department.

Wayne Zorger is scout in charge of a new office which Amerada Petroleum Corp. has opened in Shawnee, Okla.

Dr. Carl C. Rister, research professor of history at University of Oklahoma, has been assigned to prepare a history of oil development in the Southwest. A year's leave of absence has been granted him for performance of the task.

Harry S. Gramlich, district manager for Sun Oil Co., has been elected a councilman of Franklin, Pa.

Edward O'Rourke, engineer and geologist, heads the new school of petroleum engineering established at Marietta (Ohio) College. O'Rourke was on the engineering staff of the old Marland Oil Co. and later served Gulf Oil Corp. in this country and South America. The school of petroleum engineering was founded through an endowment of $300,000 left by the late E. R. Brown, pioneer operator in the Mid-Continent region and chairman of Magnolia Petroleum Co. at the time of his death.

Harold G. Barton, formerly supervisor of oil and gas operations for the U. S. Geological Survey in the California region, has been transferred from Los Angeles to Washington, to become chief of the oil and gas leasing division. **Leroy G. Snow,** formerly supervisor at Roswell, N. M., has succeeded Barton at Los Angeles. **Foster Morrell,** formerly deputy supervisor at Roswell, has succeeded Snow as supervisor of oil and gas operations for the southwestern region.

Edward J. Brook, recently discharged from the Navy as a lieutenant commander with 33 months overseas service, has joined Franco Wyoming Oil Co. and Franco Western Oil Co. as assistant to President W. D. Waltman. Brook is a graduate of the Colorado School of Mines.

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AVAILABLE AT YOUR FAVORITE SUPPLY STORE OR XMAS TREE FABRICATOR AT PRICES COMPARABLE TO THOSE OF COMPETITIVE VALVES.

See pages 2194 to 2211 in 1944 Composite Catalog

Orbit Valves Require No Lubrication to Effect a Seal.

ORBIT VALVE COMPANY
TULSA, OKLAHOMA

Southwest Texas

(Continued from page 130)

on drill-stem test in Lopez sand at 2,310-17 ft. The tool was open 20 minutes and built up 13 lb. of top working pressure with 500 lb. bottom-hole pressure. Operators have set the 5½-in. production casing to 2,313 ft. for the completion attempt.

Thirty-three new locations were reported for this district with nine being wildcats, one each in Bee, Duval, Goliad, Guadalupe, Live Oak, Milam, Refugio, Starr, and Victoria counties. Of the 25 completions, 10 were dry wildcats, one each in Bee, Guadalupe, Hidalgo, Jim Wells, McMullen, Milam, San Patricio, Starr, Victoria and Webb counties. Jim Wells County led with four completions reported.

SOUTHWEST TEXAS WILDCAT FAILURES

Bee County: W. C. McBride, Inc. 1 H. W. Frels, Teodoro Molina Sur., 5 mi. NE Beeville, dry at 3,900 ft.

Guadalupe County: Leon V. Manry 1 Effie Williams et al, James Alley Sur., 6 mi. S and 3 mi. E Seguin, dry at 3,002 ft.

Hidalgo County: Dee Davenport 1 Boston-Texas Land Trust, Los Maguelles Grant, 7 mi. SW McCook, dry at 6,255 ft.

Jim Wells County: W. R. Quin 1-A Robert Adams, GHRR Sur. 104, Block 6 Waldron Oil & Gas Subd. of Robert Adams Ranch, 1½ mi. SW Reynolds, dry at 4,439 ft.

McMullen County: Plymouth Oil 1-A Harry Ezzell, agent, Hays-Ezzell Sub., Sec. 8, 6 mi. SW Calliham, dry at 7,214 ft.

Milam County: Hamman Oil & Refining 1 C. C. Cross heirs, Monroe Edwards Sur., 5 mi. N of Branchville, dry at 2,200 ft.

San Patricio County: Sam E. Wilson, Jr. 1 Hogg estate, John Robinson Sur., 2½ mi. S Ingleside, dry at 8,560 ft.

Starr County: Heep Oil 1 Starr County Cattle Co., Blk. 11, Porcion 89, 10 mi. NE Rio Grande City, dry at 2,760 ft.

Victoria County: Monday Oil 1 H. F. Witte, Leonardo Rodriguez League, Abst. 99, 9 mi. S Victoria, dry at 5,850 ft.

Webb County: Callaghan Land & Pastoral Co. 1 "Becerra," Callaghan L. & P. Co. fee, Sur. 440, 18 mi. SE Encinal, dry at 1,500 ft. (Completed as a fresh water well).

Permian Basin

(Continued from page 133)

completions this week and Fullerton field, Andrews County, had five. Garza field, Garza County, reported five new locations. Keystone Colby, Winkler County, four, and Keystone Holt three.

WEST TEXAS SUCCESSFUL WILDCATS

Hockley County: Extension to old oil pool —Texas 1 Ira DeLoache, Lab. 21, Leag. 73, Reeves CSL Sur., 2 mi. N and slightly W Levelland field, elev. 3,625 ft., pumped 15 bbl. day through 2-in. tubing, perf. 4,740-4,800 ft. San Andres, gravity 31°, TD 4,841 ft.

WEST TEXAS WILDCAT FAILURES

Crane County: Gulf 1 J. T. Muir, Sec. 23, Blk. B-27, PSL Sur., elev. 2,468 ft., Waddell 5,691 ft., Ellenburger 6,120 ft., dry, TD 6,137 ft.

Ector County: Humble 1 H. E. Cummins, Sec. 11, Blk. 45, T-1-N, T&P Sur., N Goldsmith pool, elev. 3,420 ft., Simpson 8,385 ft., Ellenburger 9,165 ft., dry, TD 9,235 ft.

Runnels County: H. W. Snowden 1 H. S. Bright, Sec. 36, CCSD&RGNG Sur., 2 mi. S Tokeen, elev. 2,114 ft., dry, TD 4,400 ft.

Upton County: Cole-Gruber & Coburn 1 Superior - Starnes, Sec. 1, Blk. W, GC&SF Sur., 10 mi. SE McCamey elev. 2,426 ft., dry in San Andres, TD 1,870 ft.

PANHANDLE WILDCAT FAILURE

Wheeler County: Sinclair Prairie 1 Henderson, Sec. 16, Blk. A-8, H&GN Sur., 9 mi. NE Shamrock, elev. 2,272 ft., dry, TD 8,514 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—A 4-mile northwest extension of the Yeso, basal Permian production in the Paddock area of southeastern Lea County, has been completed. It is Neville G. Penrose, Inc., 1 Jones, 6-22s-38e. On official 24-hour test the well flowed 912 bbl. of 28°-gravity oil through perforations from 7,040-160 ft. Total depth is 7,205 ft. Carl B. King Drilling Co. et al 1 Santa Fe, 29-9s-37e, extreme northeastern Lea County wildcat, is a failure at 4,986 ft. after test failed to show oil in commercial quantity. On a test from 4,915-86 ft. the well had swabbed about 10 bbl. of new oil per hour, but as swabbing continued the oil decreased. Penrose 6 Hinton, 12-22s-37e, is a flush producer for the southwest side of the Paddock field in southeastern Lea. After acidization with 2,000 gal. from 5,150-80 ft., the swab was run four times. It kicked off and flowed into pits for 4 hours. Turned into tanks, it flowed 75 bbl. of oil in 180 minutes.

Lea County had four field completions this week and Eddy County three. Lea County reported nine new field locations.

North Central Texas

(Continued from page 136)

er, J. C. McGinnis Sur. A-1298, 3 mi. S and E Newport, elev. 1,064 ft., Ellenburger 6,888 ft., dry, TD 6,920 ft.

Wichita County: Nixon Petroleum 1 Snow, Sec. 3, H&TB Sur. A-125, 2 mi. S Clara, dry, TD 2,255 ft.

F. W. Whitaker 1 Anderson & Patterson, Blk. 56, KWVFL Sur., 2½ mi. N and 1 mi. W Holliday, elev. 1,038 ft., dry, TD 818 ft.

Young County: Panhandle 1 Maude Graham, D. Pruitt Sur. A-1516, 4 mi. W and 1 mi. N Eliasville, elev. 1,227 ft., Mississippi 4,632 ft., dry, TD 4,673 ft.

WEST CENTRAL TEXAS

ABILENE.—Sohio Oil Co. 1 Irl Faver, Section 50, Block 21, T&P Survey, wildcat 4 miles southeast of Sweetwater in Nolan County, topped the Strawn sand at 5,662 ft. It was perforated with 35 shots from 5,672-77 ft. The test flowed into pits at the rate of about 10 bbl. of fluid the first hour, being 70 per cent oil and 30 per cent salt water, after which the flow decreased to about 1 bbl. of fluid per hour. It flowed at the rate for 6 hours and died. The operator will squeeze and reperforate. Rhodes Drilling Co. 1 W. D. Swan, I. Miley Survey 281, wildcat 12 miles northwest of Merkel, Jones County, is being completed in the Saddle Creek lime after a drill-stem test of that section had shown 2,600 ft. of oil in the hole in 40 minutes. Pipe was set at 2,697 ft.

Reddin field, Jones and Taylor counties, had three completions this week. Jones County reported two field locations.

WEST CENTRAL TEXAS WILDCAT FAILURES

Brown County: Double B Drilling 1 C. C. Baxter, Sec. 22, HT&B Sur., 1 mi. NE Bangs, elev. 1,629 ft., Ellenburger 2,358 ft., dry, TD 2,379 ft.

Roy M. Johnson 1 A. H. Brewer, Sec. 29, HT&B Sur., 2 mi. NW Bangs, elev. 1,621 ft., Ellenburger 2,410 ft., dry, TD 2,463 ft.

Haskell County: Manning & Brown 1 F. A. Adair, Sec. 7, H&TC Sur., 10 mi. E and 2 mi. N Stamford, Palo Pinto 3,218 ft., dry, TD 3,335 ft.

Taylor County: Stanley A. Thompson 1 Minnie Bowles et al, Sec. 26, Blind Asylum Land, 3 mi. NE Abilene, elev. 1,758 ft., Flippen 1,782 ft., dry, TD 2,172 ft.

Appalachian Fields

(Continued from page 137)

County. In Ripley district, United Carbon Co. will test Lovell M. Parsons, Jr. with a starting elevation 782.4 ft. and West Virginia Gas Corp. will test Howard Hopkins, elevation 718 ft. Other locations include Washington district, Boone County; Buffalo and Henry districts, Clay County; Center and DeKalb districts, Gilmer County; Poca district, Kanawha County; Washington district, Lincoln County; Franklin district, Marshall County; Summerville district, Nicholas County; Slab Fork district, Raleigh County; Grant district, Ritchie County, and Buchhannon district, Upshur County.

It is reported that the major companies in the southwest Pennsylvania areas have planned curtailing their drilling to a minimum after the close of present programs. It is stated that under present conditions, it is less costly to purchase gas than to drill and produce it. This will eventually mean that independent operators will probably be able to obtain much of the acreage now leased but with gas sales contracts attached.

Only three new locations were made during the week and they were located in Plum Creek Township, Armstrong County; Morgan Township, Greene County, and Washington Township, Indiana County.

Rocky Mountain Area

(Continued from page 138)

covery which made 264 bbl. natural first 24 hours. Offsets have now been drilled on the east, south, and west. Each has gone a little deeper into the pay without encountering water, the discovery stopping only 2 ft. in the sand. Continental Oil Co., which controls most of the acreage in the field, is spudding in a north offset in 10 Brown, SE SE SE 17-15-30.

Hard tight sand at Buckingham.—Fred M. Manning, Inc., and George Dickey 1 Ashbaugh, C NE NE 15-7n-59w, Buckingham district, Weld County, Colorado, topped the Muddy at 6,709 ft. and found the sand very hard and tight and giving up only bubbles of gas. It is coring ahead at 6,722 ft.

Tide Water Associated Oil Co. 1 Weld County-7, NW SW SW 1-3n-61w, Wiggins district, northeastern Colorado, after finding water in the Lakota, top at 6,777 ft., has reached a depth of 6,985 ft. and looks like a dry hole. Same interests plan another deep test 16 miles north in Morgan County, in the Orchard area 7 miles southeast of the Greasewood pool, in SW SW SW 30-5n-60w.

New operations.—Nine new operations were reported in the Rocky Mountain area, of which four are in Colorado, one in the Garland field in Wyoming, two in Montana, and two on the Barker Creek dome in northwestern New Mexico. All are development wells except two in Colorado. One of these is the Tide Water Associated location in Morgan County, and the other is Algord Oil Co. 1 Guiberson, C SE NE 18-2n-102w, Rangely field, an outpost on the north.

Completions.—Completions were slowed down by the Thanksgiving holiday. There was a total of seven, of which five were oil wells with initial production of 1,670 bbl., and two were dry holes. These were distributed four oil wells for 1,420 bbl. and one dry hole in Wyoming; one oil well in Cat Creek in Montana, and one dry hole in Fulcher Basin, northwest New Mexico. There were no wildcats. The Wyoming dry hole was Continental Oil Co. 10 Gebo Unit, an outpost on west side of the Gebo field, which made 659 bbl. of water in 23 hours from the Embar through perforations at 5,120-30 ft., total depth 5,191 ft.